THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888

No. 51. DECEMBER 22, 1951 VOL. 63.

PAPERS PRESENTED TO CONGRESS, N.V.M.A., 1951

No. 4.—PARASITIC BRONCHITIS IN CATTLE*

BY

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Mr. Alan J. Wright, M.R.C.V.S., of Macclesfield, the incoming President of the Association, took the chair at this finely attended session at the Floral Hall, Winter Garden, Eastbourne, on Friday, September 28th, 1951, when the Recording Secretary, Mr. T. A. R. Chipperfield, B.SC., M.R.C.V.S., of Crowborough, had a busy time in intimating the many speakers who wished to participate in the discussion on Dr. E. L. Taylor's paper on the subject of "Parasitic Bronchitis in Cattle," the opener being Mr. J. W. Bruford, M.R.C.V.S., of Sevenoaks, Senior Vice-President of the N.V.M.A.

The CHAIRMAN: As you know, this paper by Dr. Taylor, "Parasitic Bronchitis in Cattle," has been printed and published and circulated to members, and, according to the Articles, it is taken as read. I am, however, going to ask the author to say a few words to introduce his paper. After that the discussion will be opened by Mr. Bruford.

We are very fortunate indeed to have Dr. Taylor with us as the author of this very interesting paper. I am sure it is going to be of great interest, particularly to large-animal practitioners and to practically all branches of the profession. Dr. Taylor needs no introduction from me. When parasitology is mentioned one immediately and automatically thinks of him. I think it is quite correct to say that he is probably recognised as *the* leading veterinary parasitologist in the world. (Applause.)

For the opener, we have a first-class practitioner who will deal with the clinical and practical side and tell us how he sees and finds things in the field. I refer to our worthy Senior Vice-President, Mr. Bruford. Here again, he needs no introduction to the vast majority of you.

As we have not got a great deal of time I will straight away ask Dr. Taylor to introduce this excellent paper.

Dr. E. L. TAYLOR: With reference to the very kind remarks of our Chairman relating to parasitology and parasitologists, I would just like to put the matter into a certain perspective by reminding you how very small are our numbers in parasitology. That is one of the reasons for the poor state of our knowledge on such things as parasitic bronchitis and this coughing disease of cattle that we are discussing to-day.

I am very sensitive indeed of the honour I have been done in being asked to present this paper this morning. I am also very appreciative of the kind consideration which permits me to spend a few minutes in making my apologies. In reading through the paper I find there are quite a number of things I should like to alter; in fact, I find myself in the position of changing my mind many times in trying to answer such questions as: Why does this coughing disease of cattle, and particularly adult cattle, sometimes appear so suddenly? How is it that this year it is so prevalent in the South of England but apparently not in the North? Why is it that it appears to be associated with adult cattle in particular? It is said to be a woman's privilege to change her mind sometimes without any apparent reason. That is a matter of privilege, but I think it is an essential attribute of the enquiring mind, if it is any good at all, to maintain a certain plasticity which allows it to change, and guarantees that it will keep on changing very readily until some real evidence comes forward which enables it to reach a sound conclusion.

One minor alteration which I should like to have made to my paper concerns the opening sentence where I refer to the stimulation of a discussion on parasitic bronchitis. I realise now that the real object of the paper is much wider, that is, to stimulate a general discussion or to form the basis for a general discussion on this coughing disease in cattle. It will be for Mr. Bruford to indicate the lines upon which the discussion should go and to give the final stimulus.

The usual order of events in the progress of research is first for the work to be done and then for the paper to be written. On this occasion the order is rather reversed because the first few observations have only just been made and yet here is the paper. It is hoped that the discussion this morning will make more clear to us the lines along which future work should go.

Scientific papers in general may be put under one of three headings. First of all, the recording of experimental data and the statement of conclusions that may be drawn therefrom. Secondly, a discussion on scientific data already available, and an account of the conclusions that may be drawn therefrom; and thirdly, just an account. I hope that possibly I may have avoided the third category, though perhaps by only a narrow margin, by taking some sort of compromise between the first two.

These are preliminary observations, and it merely comes to this: We have seen microscopic larvae in the lungs of cattle which are very ill from this coughing disease. We have found out that those larvae will remain there for many days and in some cases for weeks without further development. We think that the lung tissue as a result of the invasion of these larvae becomes sensitised and reacts violently to their presence there on a second occasion.

My colleague, Mr. Hudson—who I hope is here this morning, though I do not see him among the audience—has been very interested in this disease. His particular line of interest concerns the search for a supposed virus or an infective agent which we believed to be the cause at one time. Another colleague, Mr. Loosmore, on the occasion of a widespread epidemic of coughing disease in the island of Jersey, managed to transmit the coughing disease to susceptible cattle at Weybridge and to *passage* that infective agent through some 15 or 20 animals, so

* Presented to the 69th Annual Meeting of the National Veterinary Medical Association, at Eastbourne, on September 28th, 1951.

there is a certain amount of real evidence of the existence of some infective agent other than parasitic worms.

It was an original suggestion, since Mr. Hudson had spent so much time in search of this infective agent, that he and I should prepare a paper together, but he thought in the end that as the development ultimately came along the line of helminthology rather than bacteriology I should produce the paper alone. However, he had gone much more deeply than I had into the histopathology of the subject, and I had hoped he would be here this morning in order to relieve me of some of the responsibility. I would much rather have left that part of the subject to him.

In general the epidemiological line of enquiry in the field where these outbreaks actually occur is a very interesting one. I must admit to having been rather severely shaken from my original idea that some other infective agent was at the root of it all. In any case I should like to shift the emphasis to the point of view that not all of the outbreaks of coughing disease in cattle are due to infection with *Dictyocaulus viviparus*. It was Mr. Bruford who perhaps shook me more severely than anyone else and was more insistent that this coughing disease was due to husk worms, in spite of the fact that I was unable to find any confirmatory evidence. I think it is a very good example of the heights to which clinical acumen can go.

I was, nevertheless, still left with the opinion that there are other agents. Now that we have improved our techniques a little, and by a rather long procedure are able to find these husk worm larvae in faeces when present in very much smaller numbers, we are of course finding many more infected animals. However, in some cases we do not find anything at all and, as I say, I still prefer to keep an open mind and I still have the opinion that there are other causes, either infective agents or perhaps chemical substances from some of the herbage plants.

In the course of my paper I have emphasised the importance of ecological and epidemiological enquiry. The method used is to go out into the field and make very careful enquiries into the history of an outbreak, at the end of which one has an idea that it has come about in a certain way—perhaps that the larvae must have been in the herbage right through the winter, or that the animals must have been particularly susceptible because they have not been previously infected. Having got a few ideas of that kind one goes back to the laboratory and sets about trying to reproduce the disease under controlled conditions including the doubtful factor as the only variable.

In making these field enquiries one has to observe some elementary precautions; one has to be something of a practical psychologist when trying to get information from owners and cowmen. In the course of the enquiry it is, for instance, fatal to give any lead as to what information is wanted! It is found to be necessary to go over the same point from several aspects. One mentions a point in connection with the fields and makes a mental note of the answer given, then later goes over the same point in connection with the cows that were grazing those fields, and if a different answer is given it effectively cancels the first one out. Perhaps one talks about the matter with different people; on one occasion the owner, on another with the cowmen, and possibly also with a veterinary practitioner. The stories given are sometimes amazingly different and it is very important to check one man's story with another's in this way.

The matter of psychology comes in in several directions. Michel, who has been working with me at Weybridge, came to the conclusion in connection with one outbreak that the responsible factor was the cowman having flat feet! That is a rather unexpected conclusion to come to, but it was certainly on that account that the cowman had failed to make use of certain pastures, which were a little farther away from the building, the employment of which would probably have saved the situation.

For my own part, I am still swinging from one idea to another in an attempt to explain the occurrence of this disease in time and in geographical distribution. At the present I feel very strongly that lush pastures have something to do with it, either through encouraging larval development or through some chemical action working with the larvae when they invade the lung. I also think that the creation of susceptible communities of cattle, by new methods of pasture management under which the cows are kept on quite a different part of the farm from the calves, may have something to do with it. I feel quite strongly on that point at the moment but I realise that after a little more work I might have to change my mind again. So I think it will go on, until we come to some really sound evidence, which to satisfy me will have to be strong helminthological evidence, obtained by actually producing the disease with an experimental infection of worms in the laboratory, or by showing quite clearly in some other way that they are or are not responsible.

Finally, in connection with the discussion this morning, I should like to say a word with reference on nomenclature. I think we ought to be careful about the way in which we use this word " husk "; if we wish to speak of a disease caused by *Dictyocaulus viviparus* we should use " parasitic bronchitis." If we refer to a virus disease or a disease caused by some other transmissible microscopic or ultramicroscopic agent perhaps we could use the term " Jersey Island disease " or " Channel Island disease," and I hope no one will object. Another term that we must use is " fog fever," but I feel that if we do not indicate the differences very clearly the whole discussion itself may suffer from that complaint.

Dr. Taylor's paper was as follows:—

The function of this paper being to stimulate discussion, it is proposed to make full use of the freedom accorded by the Organising Committee and to present some personal ideas, hoping thereby, should I fail in my endeavours to be stimulating, at least to be provocative.

It was in 1937 that an N.V.M.A. Congress last gave its attention to parasitic bronchitis, in discussing a paper presented by R. H. Smythe on *The Clinical Aspects and Treatment of Hoose*. That the Committee should have thought the time ripe for another discussion on the same disease bears witness to its prominence among the parasitic diseases of our livestock. Although the nature of my vocation, in helminthological research, may suggest a different approach, nevertheless, it is not my intention to avoid those parts that were previously discussed, but only to shift the focus of attention a little towards the epidemiological aspect which at the present time is one of the most promising in parasitological enquiry. Special emphasis will also be given to the disease as it occurs in adult animals and the contributions of clinicians on this subject are anticipated with particular interest. Recent observations and experiences have led to the conclusion that there are certain important differences in parasitic bronchitis as it occurs in young and in adult animals, so that the following account will be divided into two main parts, first dealing with the " Typical disease "

as generally seen in young animals and secondly the "Atypical disease" seen in adults.

With some reluctance I have decided not to use the old term "hoose or husk," partly because of the curious requirement which practice dictates always to mention the two alternatives, but mainly because of the confusion that may arise through the use of a name given to a particular cough that is an outstanding symptom of the disease, but that may also result from causes other than the presence of nematode worms. The term "parasitic bronchitis" seems to be more generally satisfactory as in the bovine it can refer only to one kind of parasite, and it has the advantage of familiarity over the newer inventions of the specialists, who in their own discussions may prefer "Dictyocauliasis" or even "Dictyocauliasis viviparus," which high-sounding names may be regarded as pedantic for our present purposes.

Typical Form of the Disease

This is the form of the disease that is dealt with in the text-books and in most published accounts of original observations. It is well known to all practising veterinarians, who are concerned with the health of cattle throughout the British Isles and in many other parts of the world where a moist and temperate climate provides the conditions suited to larval development in the field. It appears to cause less damage in the large continental areas and it may not be far wrong to associate it particularly with an island climate. Even in our own islands the wetter parts are the worst affected, cattle in Ireland perhaps being more severely affected than those in any other part.

Although it is unnecessary to go into a redescription of the symptoms which are so well known to everyone, a brief reference should be made to what appears to be an unwarranted reliance placed upon the "husk cough" for the diagnosis of the disease. There is an undoubted tendency, amounting almost to a general practice, to diagnose parasitic bronchitis on the presence of this symptom alone, and although it may be regarded as strong presumptive evidence, adequate for a working diagnosis when circumstances are in conformity with the existence of the disease, it would appear to be an unwarranted assumption in the face of contrary evidence. There can be no doubt that other lung diseases of cattle are capable of giving rise to this same cough, notably a pneumonia prevalent among housed calves such as has been described to me by Dr. H. G. Lamont as of particularly common occurrence in Northern Ireland.

Etiology

The "typical form" of this disease is caused by the presence of numerous adult nematode worms of the species *Dictyocaulus viviparus* in the smaller bronchial tubes. It would seem to be a natural consequence that an irritation of the lining membrane should follow, although it is not always so, and we have been surprised at the tolerance shown by some of our experimental animals to the presence of these parasites in considerable numbers. The irritation in the small bronchial tubes results in a catarrhal inflammation and an exfoliation of cells and an outpouring of exudate that may lead to an occlusion of the air passages which already contain many worms. The air system behind the blockage then fills up with the exudate and that portion of lung becomes virtually drowned.

Evidence of this sequence of events is easily seen on *post-mortem* examination when the bunches of worms surrounded by the bronchial exudate are observed towards the terminal subdivisions of the bronchi. Portions of solid lung are also usually observable of a darker colour and clearly differentiated from the adjoining healthy tissue. In a severe case these areas are extensive and if the bronchial tubes are examined (the best method of examination being by the use of blunt-pointed scissors, working outwards from the larger bronchial tubes) they are found to be packed with the adult worms, in such numbers as to leave no doubt upon the cause of death.

This classical conception of parasitic bronchitis has provided us with a semblance of complete understanding, the successful delineation of the life history of the parasites seeming to have filled in all the wanted details, so that we are pleased with the sweet logic behind our explanations and proud of our knowledge. Later on, however, we may have to admit to a possibility that self-complacency has dulled perception and that we have been slow to realise the gaps in our understanding. As some of the points concerning the bionomics of *Dictyocaulus viviparus* are relatively new and as some are of importance in understanding the epidemiology of parasitic bronchitis it is thought advisable to deal with this part a little more fully than with the parts already covered.

Bionomics of Dictyocaulus Viviparus

The biological aim of this species, as with all others, being the reproduction of its kind in ever-increasing numbers, the function of the female is to feed well in order to produce the greatest possible number of eggs over the longest possible period. The eggs already contain developed embryos when they are laid and most of them hatch on their way along the bronchi and the trachea to the throat. Although a certain number of the resulting larvae may chance to be directly expelled from the throat through violent coughing, the great majority are swallowed and are passed on to the ground during defaecation. These larvae are still in the first of the five stages of nematode development, two of which must be completed before they are capable of taking up a parasitic existence in a new host. Between each successive stage of development the young worm changes its skin, a curious feature concerning the two first moults being the retention of the old skins which the larva wears as an overcoat of double thickness to serve as a protection against the stresses of a free-living existence.

Three conditions only are required for this early development, adequate moisture to prevent desiccation, a sufficiently high temperature, and a plentiful supply of oxygen. Food appears to be unnecessary, as when the larva leaves the egg it is provided with an ample reserve in the form of granules in the body cavity and within the large cells that form the wall of the intestine. The residue from this store, after the completion of the first two stages, may be considerable and serves to fortify the infective larva against the long period through which it may have to wait for an opportunity to take up parasitic life. The physiological age of one of these resting larvae may be judged by the size and number of the granules which become reduced to mere specks when a larva nears the end of its durability in the free state. As in general the metabolic rate of living creatures increases with a rise of temperature, one may presume that the possibilities for prolonging the waiting period are reduced during the warmer weather.

A knowledge of the bionomics of the larvae during these initial free-living stages is of the greatest importance in understanding the epidemiology of parasitic bronchitis. Unfortunately the literature contains very few accounts of observations made directly on the larvae of *Dictyocaulus* themselves, nor on those of any lung-worm larvae. There are, however, many publications on the reactions of the larvae of the stomach worms of ruminants, on the red worms of horses and most particularly on the hook worms of man, but argument by analogy is unreliable in the biological field and we must avoid too great an assurance that we understand the larvae of the lung worms. Interesting differences already have been observed and it is very possible that the explanation of some of the curious points concerning the occurrence of parasitic bronchitis may be found in as yet unrecognised peculiarities of the free-living larvae.

Laboratory investigations on the reactions of *Dictyocaulus* larvae soon show that in some ways they are peculiar. In the first place they are not nearly so easy to nurse through the first two stages of development as are the larvae of the stomach and intestinal worms; the usual crumbly mixture of faeces and peat moss, sphagnum moss or animal charcoal, which is a very satisfactory culture medium for these other larvae, does not serve at all well for *Dictyocaulus* that develop much better if kept in well-aerated water, which conditions are not suited to the stomach-worm larvae.

It has been interesting to observe, in sheep's faeces of a pellity consistency, that the larvae of *Dictyocaulus filaria* are found on the outside of the mucus coat that surrounds each pellet, from which position they can be washed with the greatest facility. These observations suggest that the larvae thrive best when away from the faeces in the field and lead one to suppose that heavy rains, or the presence of surface water on the ground, may be beneficial to their development.

The belief has been expressed to me that the kind of land on which surface water may occasionally lie for some days, or perhaps for weeks, is the environment in which parasitic bronchitis is likely to occur and the above mentioned observation lends support to this view. The widely held view that in general wet places are wormy places is not, however, to be accepted without some reservation, it having clearly been shown that periods of drought with accompanying shortage of pasture are attended with peculiar dangers for the development of parasitic gastritis. Outbreaks of parasitic bronchitis among cattle grazing on a dry, chalky pasture have occasionally come to my notice, and outbreaks commonly occur on ground that in no way could be regarded as particularly wet.

Further evidence comes through the attempted association of a high incidence of the disease with wet seasons. This is not always as clear as is generally supposed, a comparison of the late summers of 1949 and 1950 providing a good example of the lack of correlation in that the occurrence of parasitic bronchitis was much more widespread during the relatively dry season of 1949 than it was in the unusually wet one of 1950. It is a curious point, however, that this difference was not country wide and that in certain parts, notably in Cambridgeshire and Huntingdonshire, the wet season of 1950 was worse than the preceding dry one for the occurrence of the disease.

Such observations as these reflect on our lack of understanding and show the requirement for more research, but it seems reasonably certain that the larvae of *Dictyocaulus* are particularly well suited to development in water and it may be supposed that dirty drinking places, shallow ditches and surface water on fields constitute a particular danger for parasitic bronchitis, but not for parasitic gastro-enteritis of ruminants or strongylosis of equines.

Requirements of temperature are again different, the neighbourhood of 80° F. approximating the optimum for stomach worms, but being too warm for the lung-worm larvae which thrive best at a much lower temperature and can proceed with their development at cool temperatures, such as almost completely inhibit the development of stomach-worm larvae.

Yet another difference is seen in the tendency to migrate upwards into the herbage which is so well marked in the stomach-worm larvae as soon as they have reached the infective stage. The larvae of *Dictyocaulus viviparus* are, in comparison, of a sluggish nature and in the laboratory have not been found to show any marked tendency for upward migration on moist surfaces.

Observations on the tropisms of stomach-worm larvae were first recorded by Veglia in the report of his work on *Haemochus contortus* and have since been found to apply very generally to the infective larvae of allied worms in the stomach and intestine. In addition to the negative geotropism that has just been mentioned, he observed responses to light, a positive tropism for dim light and a negative tropism for a strong light causing the larvae to climb in greatest numbers into the herbage during the dim light of the evening and the morning, but to descend again to the ground after the light had reached a certain intensity. This scientific observation appeared to offer a very nice explanation for the belief, widespread among stockmen, that the early morning and the late evening are particularly dangerous times for the acquisition of lung worms; it is disappointing, therefore, not to be able to demonstrate the same climbing activity in the lung-worm larvae. Laboratory imitations of field conditions, however, may be faulty and there can be no doubt that several important points concerning the bionomics of the free-living larvae of husk worms still await recognition. It is possible that under the required conditions, whatever they may be, these larvae will prove to be particularly active climbers, and, indeed, that would very fittingly explain the sudden onset of some of the outbreaks of parasitic bronchitis. All these points await investigation.

The longevity of infective larvae in the pasture herbage is another particular in which *Dictyocaulus* appears to differ from other strongyloid larvae. According to several observers the lung-worm larvae are less resistant to dryness and as that is the factor least favourable to the longevity of any of the larvae that we are discussing the pastures are thought not to retain their infectivity for long. A recent American report of observations (Porter[3]) on dry pastures in which the infectivity was tested by the successive grazing of susceptible cattle, indicated that the larvae lived for one week but not for six or seven. In Germany Wetzel[5] concluded that the larvae of *D. filaria* do not survive the winter on pastures. In contrast to those observations an enquiry into the circumstances attending outbreaks of parasitic bronchitis on pastures in the South of England suggests to me that disease-producing infestations have remained alive for periods approaching 12 months.

Circumstantial evidence of this kind is not of the best and

the need is only too plain for more exact information obtained under properly controlled conditions of observation both in the field and in the laboratory. It is clear, however, that important differences do exist between the reactions of the husk-worm larvae and those of the stomach worms and it seems very probable that a proper understanding of these differences will explain some of the observed differences in the epidemiology of the respective diseases which they cause.

Having dealt with the free-living existence of the worm, we can proceed to trace its course through the stages of development as a parasite of cattle. This begins at the point of ingestion by the grazing host of an infective larva which is often enclosed in a double overcoat of loose skins that were retained at the end of the first two stages of larval development. It is at the beginning of its third larval stage and finding itself in the hoped-for environment, after what may have been a prolonged delay, we may feel inclined to regard its sudden activity as more than a mere mechanical response to chemical stimulus. Presumably there is little delay in the rumen, the majority of larvae being carried along with the enormous volume of fluid that passes through the chain of stomachs and on to the intestine. There seems therefore to be little or no chance to intercept the larvae at this stage by the use of anthelmintics. The larvae soon penetrate the bowel wall and find their way through the lacteals, the mesenteric lymphatic glands, along to the *ductus lymphaticus*, into the venous circulation and to the lung where they begin to arrive about five days after ingestion. During this brief period they complete the third larval stage and many of them complete the fourth stage and enter upon the final stage of their development. The sexes are now easily recognisable, although the worms are still microscopical, being visible to the naked eye only under optimum conditions of light and background.

The young worm now makes its way from the system of blood vessels into the system of air vessels in the lung, a migration that appears to be accomplished with remarkably little damage. A period of rapid growth now begins so that within a matter of some three weeks the worm has grown from a minute larva to a worm some 3 inches in length; the females are then fertilised and egg laying begins, so completing the cycle of development.

The adult worms tend to remain in the smaller bronchial tubes, but as new individuals are added to the parasite community there is a tendency for some to move upwards into the larger tubes—presumably as a response to overcrowding. As yet we have no knowledge of the food of these worms; they are not provided with any special mouth parts that might conceivably be connected with the piercing of minute blood vessels or the removal of tissue from membranes and it is generally supposed that they feed on the inflammatory exudates and ex-foliated cells which result from their presence.

Pathogenesis

Examination of the lungs of an animal that has died of parasitic bronchitis leaves little doubt as to the way in which the injury is brought about through the presence of these worms in large numbers. The requirement for a heavy infestation is an important point, the typical form of parasitic bronchitis falling in line in this particular with what is so well known of parasitic gastro-enteritis where the very parasites that are capable of causing severe disease and death are present in almost every animal on the farm. While present in normal small numbers, which in the example of parasitic gastritis, or in equine strongylosis, may be some few thousands of the worms, there is no disturbance to the health of the animal. Similarly in the " typical form " of parasitic bronchitis, it appears that considerable numbers may be carried without producing the symptoms of disease. A notable example of this was observed in one of our experimental sheep at Weybridge. In its experimental pen this sheep appeared to be in perfect health, showing no symptoms of respiratory disease whatever, and yet at *post-mortem* examination was found to be infested with over 10,000 mature *Dictyocaulus filaria*. As a second example might be mentioned the finding of some 76 husk-worm larvae per gramme of faeces from a calf that had been housed for several weeks and that was not showing any of the symptoms of parasitic bronchitis. Similarly a heifer that recently died from other causes we found at *post-mortem* examination to be carrying husk worms, although symptoms suggestive of the presence of those parasites had not been seen for some months. Such observations as these have an important bearing on the diagnosis of parasitic bronchitis.

Diagnosis

Diagnosis is a difficulty that has puzzled both clinicians and laboratory workers, although for different reasons. Strange to say, it is only recently that the unsatisfactory position has been fully recognised. The finding of the larvae in the faeces at first appeared to be a perfect way of confirming the diagnosis and much attention has been given to the improvement of methods by which these larvae may be observed. The idea of their enumeration as " larvae per gramme of faeces " was also attractive as it appeared to provide a way of estimating the number of worms actually present in the lung. This piece of helminthological conceit has, however, been dispelled with the recognition of the influence of the state of resistance of the host upon the output of eggs; in fact it becomes clear in several directions that the classical helminthological concepts have been misleading and it is interesting to note that while the laboratory workers have so far been wrong, the clinicians have often been right, representing a triumph of art over science which is always refreshing to find.

On the clinical side there is an undoubted tendency to place too much reliance upon the husk cough, so that wherever young cattle are found to be thriving badly and a number of them to be affected with this cough, diagnosis of husk is made. There can be no doubt that this same cough may also result from causes other than the presence of husk worms, some of these conditions being particularly prevalent among young cattle kept in the farm buildings. *Post-mortem* examination of one of the affected animals may be of the greatest assistance, although again there are traps for the unwary and difficulties for all. It is helminthologically unsound to make a positive diagnosis on the finding of a few worms alone, a point to which the laboratory worker may wish to direct the clinician's attention in order to modulate the unbearable glitter of the triumph to which reference has just been made. No experienced clinician would think of diagnosing strongylosis in equines or parasitic gastro-enteritis in ruminants merely on the finding of a few hundreds or even a few thousands of the parasites on *post-mortem* examination and there does not appear to be any reason for supposing *Dictyocaulus* in the lung of cattle to be markedly different in that respect.

Of the greatest significance, perhaps, is the history of the outbreak which should clearly reflect the way in which a heavy helminthic infestation may have been acquired through the active collection of larvae by the grazing animals from their surroundings. This implies the appearance of the symptoms at or about the same time in several members of a group of susceptible animals. Here again, however, the clinician still awaits some guidance from the laboratory worker on the length of time for which a pasture may carry a significant infection and of the dangers from infected hay or from soiled bedding where the cattle are kept in yards.

Epidemiology

Under this heading we shall be able to consider in some detail the factors that operate towards an increase in the parasite population and enable us to understand the history of an outbreak. Among these the circumstances favourable to larval development on the ground will be of great importance. Damp ground and long herbage which prevents the rapid drying of the faeces is undoubtedly favourable to the larvae and we may suppose the presence of surface water also to favour their development in a way that it is not favourable to the stomach and intestinal worms. The effect of summer temperatures would appear to be of less importance, but it has to be admitted that much of what is written on these points is a matter of surmise and it will only be as a result of the substitution of knowledge for supposition on this important aspect of larval development that we shall be able to explain the marked differences in the prevalence of parasitic bronchitis from year to year.

Other important influences concern the crowding of stock on to the pastures, this leading to closer grazing and the collection of more larvae which, on account of their poor climbing potentialities, presumably are situated near the surface of the soil. The crowding together of susceptible young stock must be regarded as particularly dangerous, leading as it does to a concentration of heavily infected faeces and to a high percentage " take " in the grazing animals. Undoubtedly the small, handy, and often crowded paddocks near to the farm buildings where the calves are grazed are among the most dangerous places on the farm; they are often used for bucket-fed calves and this association may be put forward as an argument against any supposed greater susceptibility of the dairy breeds. The deeper one looks into the factors concerning worm increase, however, the more complicated does one find them to be. Whereas long and luxuriant herbage is an aid to larval development it acts as a diluent and lowers the rate of acquisition by grazing; one may wonder whether the increased opportunities for larval intake, as seen on bare pastures, may not have a more pronounced effect in increasing the ultimate infestation of the host. As yet there is not sufficient evidence to settle the play of opinion on this point.

Yet another factor that adds to the complexity concerns the susceptibilities of the host as affected by its age and nutritional state. The importance of this factor as it operates on animals in the field is there for all to see, particularly as it applies to age. There is ample evidence to show, however, that, just as with other worm infestations, there is a strong association between husk worms and host nutrition. It is found in experimental infections on animals kept indoors that the larvae will not " take " at all readily in a well-nourished host even if it is a calf, and presumably this factor of nutrition operates equally on animals in the field, so that, other things remaining equal, any encouragement to the grazing calves to eat good grass will be an advantage. Reference might be made to a field experiment that it was my privilege to see at an experimental station in New Zealand, comparing two methods of pasture management for the rearing of calves, one the old system of special calf fields and the other of a rotation of pastures in which calves preceded the older animals. A brief preliminary report has already appeared, McMeekan,[3] and shows the rotated group of calves to be incomparably better than those reared under the old system; in fact, so great was the difference that the groups appeared like animals of two different ages and from two different herds. Calves are pernickety over their grazing and if kept under crowded conditions on soiled pasture we may suppose, using an anthropomorphic explanation, that they react with disgust to the presence of faeces on their food and do not eat nearly so much as they otherwise would do. Under bad conditions of crowded pasturing there is undoubtedly an interaction of malnutrition and parasitism and in my opinion the nutritional aspect is a very important one in which the factor of appetite plays a significant rôle.

While many observations have been made on the specific resistance (immunity) to parasitic worms little or nothing has been done experimentally to investigate the relationship between *Dictyocaulus viviparus* and its host and we can only conclude from field observations that it is one of the most important of the numerous interrelating factors governing the rise and fall of parasite population, and the appearance and also the disappearance of disease.

The Atypical Form of Parasitic Bronchitis

As this part will deal with some ideas that are new it may be advantageous to preface the account with a brief outline of the circumstances that led to the few observations that appear to provide, at least, a partial explanation. In the ordinary course of research procedure these observations would not be published until a greater weight of evidence had been acquired and it is feared that the immature exposition may be thought to have the flavour of persuasion.

Although the literature presents certain references to the occurrence of parasitic bronchitis in adult cattle these accounts are few and in general present the happenings as of an unusual nature. During the earlier part of the war a few outbreaks of severe coughing accompanied by rapid loss of condition were brought to our notice at Weybridge. In every instance they had been diagnosed by the veterinary practitioner as outbreaks of parasitic bronchitis, but the histories were of an unusual kind, animals of all ages being affected and in some instances there being no traceable connection with particular pastures. In most of these outbreaks of coughing we were unable to confirm the tentative diagnosis by the finding of larval worms in the faeces of affected animals and the few examinations that were carried out *post-mortem* failed to show the heavy worm infestation that would be expected in severe cases of parasitic bronchitis, while in some we were unable to find any worms at all. Examination of small portions of the lung by crush preparations and by the Baermann technique for the separation of living larvae failed to show their presence and we concluded that it was not justifiable to make a diagnosis of parasitic bronchitis.

A widespread epidemic of a bronchitic affection typified

by coughing broke out in the island of Jersey towards the end of the war and as soon as it became possible to do so a visit was made when enquiry showed a very considerable loss from what appeared to be this same disease, affecting cattle, irrespective of age, throughout the whole of the island. Veterinarians there were of the firm opinion that the parasite had been non-existent in Jersey until the German occupation and that it had been introduced by some French cattle that had been brought over during that period. The epidemic had terminated before my visit was made and no *post-mortem* material was available, but the examination of a considerable number of faecal samples from cattle that had only recently been affected failed to reveal the presence of *Dictyocaulus viviparus* and as the history of the epidemic was so little suggestive of a nematode infestation the circumstances were thought to give strong support to an idea, now grown into a theory, that the coughing disease was due to the presence of some rapidly dispersing agent such as a filterable virus.

The existence of some such agent, giving rise to epidemics of coughing, was demonstrated by my colleague of the department of bacteriology, Mr. Loosmore, who succeeded in transmitting the affection to four animals by means of a breathing tube, and subsequently by inoculation through a total of six passages involving 15 other animals. At the end of this time the agent was lost without its precise nature having been determined. This line of investigation was taken up at a later date by Mr. Hudson, the head of the department of bacteriology, who made an unsuccessful attempt to recover the lost infective agent. During the numerous *post-mortem* examinations that he was able to make, however, he observed that a few husk worms at least were usually present wherever this coughing disease occurred and he was inclined to think that these light infestations might be responsible for the symptoms.

Meanwhile, on account of the experimental difficulties that had previously been encountered in working with *Dictyocaulus viviparus* in cattle, we had began in the department of parasitology to work on *D. filaria* in sheep and it was during those observations that Mr. Michel found microscopical worms in the lungs of his experimental sheep several weeks after the administration of infective larvae. An opportunity was then sought to repeat this observation in cattle and was provided by an extensive outbreak found by Mr. Sellers, V.I.O. stationed at Cambridge, on one of the Huntingdonshire A.E.C. farms. This concerned some 120 two-and-a-half to three-year-old bullocks, among which developed a fulminating outbreak of a very acute form of respiratory disease accompanied by severe coughing, staring coat, lacrimation and marked loss of condition, although only a relatively slight rise of temperature. The first onset occurred towards the end of August, 1950, and practically 100 per cent. of the animals showed the symptoms in a more or less severe form at the end of the succeeding three weeks. Faecal examinations were carried out, but it was only after an unsuccessful search through some 20 samples that one was found containing a small number of the tell-tale larvae of *D. viviparus*.

One of the worst affected animals was then purchased and brought to Weybridge for *post-mortem* examination at which the lung was found to have a normal appearance apart from a greyness of some of the lobules, so slight that it would undoubtedly have escaped notice in the course of an ordinary routine examination. On incision and the application of pressure a small amount of pus could be squeezed from the cut surface. Careful examination of the air passages by opening up to the minute terminal tubes with blunt-pointed scissors revealed nothing to the naked eye, but on examination of the mucus scraped from the lining membrane we succeeded in finding minute worms. The substance of the lung was then passed through a mincing machine and a search made for living nematode larvae by the use of Baermann's apparatus. By this very imperfect means a number of microscopical worms were recovered, such as led us to suppose that some 500 or perhaps 1,000 were present. Subsequent examinations of more of these cattle and of cattle experimentally infected at Weybridge have enabled us to secure further data of this kind showing that these microscopical worms may remain undeveloped in the lung for at least ten weeks.

The helminthological significance of this inhibited development is interesting and should be considered before attempting to understand its significance in the field of pathology. Several examples of the inhibition of larval development have been observed in nematode worms, one of the earliest being that of hook-worm larvae when experimentally administered to resistant animals, larvae of the third stage of development were found still to be present in the intestine, 44 days after their administration and after the time at which they would normally have grown to maturity and been laying eggs. This was observed by Scott in 1928.[4] Mr. Michel at Weybridge has observed the same thing to occur in some of his experimental rabbits where normal development of *Trichostrongylus retortaeformis* has been arrested for 14 weeks, the young worms remaining stationary at the late third stage. Mr. Gibson's observation, a report on which is now in the hands of the publisher, concerning some of the smaller red worms of horses, belonging to the genus *Trichonema*, is even more remarkable. We now feel tolerably sure that the larvae of these worms, which spend their third and fourth developmental stages in the mucous membrane of the large intestine of the horse, may remain there for many months, and even for years, waiting an opportunity to enter the lumen of the intestine and develop to maturity. The elimination of adults by the use of an anthelmintic results in the emergence of a number of these larvae from the mucous membrane and the completion of their arrested development, when they take the place of those which have been expelled.

An excellent example of a more general kind concerns the larvae of certain species of nematode belonging to the large super family known as the Spiruroidea. These worms have the power of re-encysting whenever they are transferred to an unsuitable host. For instance, the larva of a certain species that is of common occurrence in the stomach of the pig in many parts of the world, develops through its first two stages in the body cavity of any one of a number of species of coprophagous beetles. If such infected beetles are eaten by a pig the contained infective larvae proceed with their development to maturity in the pig's stomach; but if they are eaten by some animal or bird that is not a suitable host, then the larva passes through the intestinal wall into the body cavity and re-encysts there. If that animal or bird should be eaten by yet another unsuitable host the larva may repeat this process of re-encystment, waiting for the lucky chance that may finally lead it to the only place where it can develop—in the stomach of a pig.

From the point of view of our present consideration, however, because of its pathological significance, the most interesting example is that of the nodular worm of sheep,

Oesophagostomum columbianum. Similar to the larvae of *Trichonema* to which reference has already been made, the young oesophagostomes enter the mucous membrane of the large bowel of the sheep where they complete their third and fourth stages of development, after which they are ready to re-enter the lumen of the intestine and to develop to maturity. If the infective larvae are fortunate enough to have been swallowed by a susceptible young lamb this normal course of development occurs unhindered by any reaction in the bowel wall of the host, and if the number of larvae is sufficiently large a very acute disease may result from which the lamb quickly dies—but there is still no nodule formation. On the other hand, where infective larvae of this worm enter the mucous membrane of older sheep that have previously been exposed to infection the bowel wall reacts, there is a marked deposition of fibrous tissue and large nodules are formed which if present in sufficient numbers lead to loss of elasticity of the bowel wall and to stenosis, with the result that the sheep becomes very sick and may die.

Nodular disease of the sheep, therefore, presents the very interesting circumstance of a chronic disease that occurs only in an animal that is resistant to infection and not in a susceptible one. There are in fact two distinct diseases caused by *Oesophagostomum columbianum*, the one due to excessive infestation in a susceptible animal and the other to the abortive infestation of a resistant one. The first one, due to excessive infestation, conforms to the generally accepted idea of helminthic disease, well exemplified by parasitic gastritis, but the second one, due to an abortive infestation and associated only with animals that have acquired a specific resistance, is a new concept and up to the present time has received little recognition even as the origin of nodular disease of sheep. The few observations that have been mentioned earlier in this account strongly suggest that parasitic bronchitis in adult animals may be traced to the same kind of origin. This implies two distinct kinds of parasitic bronchitis, the typical form due to the presence of numerous adult worms, which form already has been considered, and an atypical one which results from the invasion of larvae in the resistant host. Already there is some justification for thinking that the lung tissues of a bovine animal that has been infected by *D. viviparus* acquire a specific sensitivity and respond to the larvae of the worm with an irritable reaction that does not occur in the susceptible animal, and that it is this reaction of irritable tissues that is responsible for the coughing disease in adult animals. It is not improbable that further investigation will reveal some overlapping of these two forms of parasitic bronchitis and since our few observations of the occurrence of numerous adult worms without any accompanying symptoms it may ultimately be shown that the coughing symptom is usually a response to the larvae and not to the presence of adult worms. In a recent paper discussing the migrations of nematode larvae Kotlán[1] coined the term " histotropic phase " and it would appear very appropriate to apply this term to these lung-invading larvae of *Dictyocaulus viviparus*.

Treatment

Attempts at anthelmintic treatment for parasitic bronchitis have been various and have included administration of drugs by mouth, intravenously, by inhalation, by insufflation into the nostrils and by intratracheal injection, but none as yet has given any real prospect of success. A description of unsuccessful methods at the end of a long paper would be particularly wearisome, so it is proposed to deal only with a few general points that will apply most forcibly to the intratracheal method. There is still considerable diversity of opinion on the efficiency of treatment by this route, some clinicians firmly holding to the view that it exerts a beneficial action although perhaps at times rather a slight one; other clinicians conclude it to have no effect whatever, and yet a third group consider it to be dangerous to kill worms in the bronchial tubes.

When a search is made through the literature there is little to be found by way of controlled observation to provide a sound basis on which judgment may be formed, but it must be admitted that most of this evidence is against. An addition to this contrary evidence was made in connection with the Huntingdonshire outbreak already referred to. Forty-nine of the severely affected bullocks were arranged in a controlled experiment to assess the value of antimony-lithium-thiomalate, dispensed under the name of " Anthiomaline." Three groups were treated respectively with " Anthiomaline," phenothiazine, " Anthiomaline " and phenothiazine, and a fourth group kept as controls. In addition to ordinary clinical observation, the animals were weighed at intervals after treatment; no significant difference was observed between the groups, however, and in actual fact the gain made by the " Anthiomaline " group was a little less than that made by the others.

In face of the contrary evidence there is a certain amount of evidence from uncontrolled clinical observation, the value of which is less certain. Over and over again the field of medical and veterinary science has revealed the remarkably keen discernment of clinical observation. While taking full cognizance of clinical conclusion on this matter of treatment for parasitic bronchitis, however, it must be borne in mind that the circumstances detract very considerably from its value. The power of recovery of animals in the absence of treatment is well known, so that if taken away from the infected pastures and assisted by proper housing and good nourishment the specific resistance to the parasitic worms has a good chance of becoming established and of throwing off the infection. No matter how able the observational powers of the clinician may be it is asking too much of mental analysis that it should provide a correct answer on the efficiency of a drug when three other treatments known to be effective in many instances are employed at the same time. If a markedly active drug were to be used under such poor test conditions it would doubtless be possible to observe an effect by comparison with other outbreaks in which the hypothetical drug had not been employed, but where the expected benefit is only a slight one it is not possible to reach a reliable conclusion.

The clinician, however, must do something when valuable animals are severely affected and the procedure of intratracheal injection may have its place in the psychological field. The hocus-pocus of the medicine man is deep rooted in all of us and sound advice without the mystic signs ranks very low in the owner's opinion when compared with the best that veterinary science can do. When the clinician carries out a spectacular procedure his advice is likely to be treated with the respect that is due to a part of the medicine man's régime. It would seem, therefore, that only on these grounds can the intratracheal injections and the subcutaneous or intravenous inoculations of antimonial compounds or of anything else be regarded as a rational procedure. I do not wish to suggest that it is unethical, but rather that it

may be a wise thing to do; certainly it is better to regard these treatments as an insurance to the carrying out of important instructions than merely as a means of cashing in on the *vis medicatrix naturae* that does so much towards the cure of parasitic disease and not least towards the cure of parasitic bronchitis.

The research position, however, is far from hopeless. Although in advanced cases the parasites seem to be particularly inaccessible on account of the disfunction of the affected portions of lung, that obstacle to treatment by the intratracheal route would not appear to hold in the early stages of the disease. Trials with Indian ink show that injected substances reach every part of the lung, and although the anthelmintics at present known appear to be ineffective, advances in the field of antibiotics are so rapid that something useful may be expected in the future. To this hopeful prospect may be added that of a better understanding of the epidemiology of the disease and of measures for its prevention. Now, for the first time, our research potential in veterinary helminthology is such that we can afford to give some uninterrupted attention to the investigation of this important disease, and although the final solution to the problem of its complete control may be far to seek, we may proceed hopefully.

Summary

This paper discusses parasitic bronchitis as of two distinct kinds, the "typical" and the "atypical." The first of these is the familiar one seen in young cattle and is associated with the presence of large numbers of mature worms in the terminal divisions of the bronchi. It conforms to the general conception of helminthiasis as resulting from heavy infestations of the parasites concerned, exemplified by parasitic gastro-enteritis of ruminants and strongylosis of equines. The atypical form occurs more particularly in adult animals and is generally considered to have been of increasing prevalence during recent years although this supposition may represent yet another example of failure to recognise a disease entity until some particular sequence of events has brought it to notice. The aetiology of the atypical form appears to concern the entry of huskworm larvae into the lung tissues of animals that have developed a specific resistance to the worms, the symptoms being the outcome of the response of sensitised tissues to the presence of the specific parasites. The operation of other infective agents is, however, not altogether ruled out and it appears that in some instances they may be responsible for the husk cough.

Although no medicinal treatment of parasitic bronchitis has yet been shown to have effect the worms are not completely inaccessible and the research position is not regarded as hopeless. Clinical trials on farms in the absence of adequate controls are, however, misleading and where affected groups of animals are removed from the dangerous pastures, are housed well and are put on to an improved diet it is not possible even for the most discerning clinical eye to ascribe a relative amelioration of the disease to its true cause.

References

1 Kotlan, A. (1949.) *Proc. 13th Internat. Vet. Congress*, London.
2 McMeekan, C. P. (1948.) *N.Z. Jl. Agric.* August. 138-141.
3 Porter, D. A. (1942.) *Proc. Helminth. Soc.* **9.** 60-61.
4 Scott, J. A. (1928.) *Amer. J. Hyg.* **8.** 158-204.
5 Wetzel, R. (1945.) *Tierärztl. Zeitschrift.* January. 7-9.

Discussion

Mr. J. W. Bruford (Sevenoaks): When I undertook to open the discussion on Dr. Taylor's paper I thought I knew something about parasitic bronchitis, and when I wrote the first draft of my remarks, I was quite well pleased with the result. But I had hardly completed the alterations I wished to make, before I was asked to see a cow which was down in milk and looking ill. This turned out to be my first case of husk this year. Since that time I have had the opportunity of observing more outbreaks of coughing in young and adult cattle than I have seen in a similar space of time for many years. I have had, also, the good fortune to be able to consult Dr. Taylor and Mr. Michel on these outbreaks and to have had the assistance of their laboratory. The more I saw of this disease, however, and the more I tried to understand it, the more complicated and difficult became the task of opening the discussion this morning. Many of my pet theories were blown skyhigh and I began to think that I was the last person who should be opening the discussion on Dr. Taylor's paper. However, it was too late and so I decided to put before you some of the thoughts and opinions I hold at present on this complicated subject, secure in the knowledge that, should they stimulate some critical remarks from the audience, Dr. Taylor it will be who will have to deal with them.

It is, I think, desirable that we should consider for a moment the reason for the Provisional Committee selecting parasitic bronchitis as one of the subjects to be discussed at this Congress. I believe the first reason was that many practitioners were disturbed at the apparent increase in the incidence of outbreaks of more or less severe coughing in cattle, and, in particular, in adult cattle, and also the knowledge that some veterinary surgeons were of the opinion that diseases were occurring in certain parts of the country which simulated parasitic bronchitis, but appeared to have a different aetiology. These diseases were sometimes designated fog fever and sometimes Channel Island disease. Secondly, it was freely admitted by many practising veterinary surgeons that their treatment of these two conditions, and what they believed to be parasitic bronchitis, was, to say the least of it, unsatisfactory. It was felt, therefore, that a full discussion on these lung diseases of cattle would be valuable and so a request was made of Dr. Taylor to write a paper on this subject for our Congress. Dr. Taylor pointed out that the most appropriate contribution he could make was to write a paper on parasitic bronchitis; he hoped thereby to tempt the clinician, to whose observations he has, in his own inimitable way, paid tribute, to discuss the problems of sudden outbreaks of coughing seen in adult cattle at pasture. And I am sure, Sir, I shall be voicing the appreciation of everyone present this morning and many others who are not, when I congratulate him on the excellence of his paper and thank him for bringing us right up to date with research into the bionomics, epidemiology and diagnosis of parasitic bronchitis. (Applause.) Dr. Taylor will, however, be the first to agree that, even now, more research is necessary before we can claim to control the disease or to influence its course.

It is, I think, important that this discussion should attempt to decide whether or not the seasonal sporadic outbreaks of coughing in young and adult cattle at pasture in this country are due primarily to the presence of *Dictyocaulus viviparus* or whether there is some other affection of the lungs of grazing cattle which will cause a sporadic outbreak of coughing. Dr. Taylor has indeed issued a challenge by accusing, presumably the clinicians, of an unwarrantable reliance on "husk cough" for the diagnosis of parasitic bronchitis. Presumably, therefore, he suspects that there are other diseases affecting young and adult cattle at pasture a prominent symptom of which is a cough and which might be confused with parasitic bronchitis. Let us for a moment consider this suspicion. It is reasonable to suppose that few clinicians would have difficulty in eliminating any suggestion of tuberculosis, and the pneumonia prevalent among housed calves would again hardly be confused with parasitic bronchitis. Clinical observation also would tend to rule out bacterial or virus infection, on the ground that outbreaks of coughing usually occur when cattle are at pasture. Furthermore, they are seasonal and if the outbreak were to occur when the cattle were housed at night, one would expect to find a cough produced by bacterial or virus infection spread to other

cattle kept in the farm buildings; but this does not happen, nor have we any knowledge of any infectious cough spread at markets and sales or where cattle are congregated together, such as is evidenced in the infectious cough and strangles in horses. There would, however, appear to be some cause for confusion with so-called fog fever, believed to be associated with grazing of aftermath, and again there would seem to be some reason for confusion over the cause of broncho-pneumonia in imported Channel Island cattle. I have no doubt, however, that the differential diagnosis of these conditions will be the subject of discussion for some time to come.

Working as I do to a large extent in attested herds, I am convinced that normal healthy stock at pasture do not cough; also that, if one watched heifers or cows in an attested herd when grazing, no coughing would be heard unless there were something wrong. If I heard two or three coughs in a dozen animals in a field in the space of a few minutes, I would suspect these animals of parasitic bronchitis. Further, I am sure that many stockmen are wrong in believing that cattle normally cough.

Dr. Taylor, under the heading of "diagnosis" and in other parts of his paper, clearly indicates that the examination of faeces for husk worm larvae is an unreliable method of diagnosis. And so far there is no indication that diagnosis can be made by a sensitivity or agglutination test, and so I appeal to Dr. Taylor to have some sympathy for the poor clinician who has little upon which to base his diagnosis except a cough.

It would indeed be helpful if we knew the optimum conditions of climate, pasture, etc., required for an outbreak of parasitic bronchitis. This knowledge, however, must depend on an accurate knowledge of the bionomics of *Dictyocaulus viviparus* and, particularly, on the length of time which the infective larvae can exist in a pasture. It has been my experience in practically all outbreaks of parasitic bronchitis which I have witnessed in self-contained attested herds during the past year, to have been faced with the assurance of owners and stockmen that there has been no more coughing than normal on the farm in the past few years. If one believes such a statement, then the parasites must live for a very long time on pasture or the information of stockmen must be disregarded. Through the kind co-operation of Dr. Taylor and Mr. Michel, however, I have been able to confirm my diagnosis in these outbreaks. Therefore one is forced to the conclusion that for years there must have been sub-clinical husk infection on the farm which has gone undetected. In fact, the cough so frequently assumed to be a normal cough is, in all probability, one provoked by the presence of lung worms, and, bearing in mind the important observation of Michel, who found microscopical worms in the lungs of his experimental sheep several weeks after the administration of infective larvae, it is permissible to postulate that pasture may be constantly re-infected by supposedly healthy livestock grazing thereon.

Whether or not the pasture or the cattle, or both together, are the means of maintaining sub-clinical infection on a farm for many years without causing clinical symptoms is certainly not clear. The suddenness of onset of severe coughing in young or adult cattle suggests that the factors which either cause a rapid development of infected larvae in the pasture or provide the conditions favourable for wholesale ingestion, are of great importance, and I support most strongly Dr. Taylor's plea for more research into larval development and the factors governing the rise and fall of the parasitic population. Dr. Taylor points out that age and nutritional state are important factors governing the susceptibility of the host; broadly speaking, I would agree with this statement in so far as young animals appear to be more frequently affected than adults, but in parasitic bronchitis I believe the nutritional state of the animal plays the more important part and if calves and yearlings were treated as well as adult cattle, the difference in age susceptibility would not be so evident. Often calves and yearlings are turned out in the summer, first on to a poor pasture because good, luxuriant pastures frequently cause diarrhoea in the young stock, and then, after a sufficiently long period on the old pasture, and when their nutritional plane is dropping, they are moved on to the more succulent and better pastures which, however, temporarily produce a setback by causing diarrhoea. This sequence of events would be sufficient in some cases to produce a fairly sudden onset of clinical disease. It is probable that, had the grazing been used the opposite way round, no clinical symptoms would have been observed and the farmer would, once again, have avoided an outbreak of parasitic bronchitis.

I have recently experienced an outbreak of coughing in a herd of 60 cows. This herd had grazed 36 acres of good pasture until the end of July when a further area of 28 acres of aftermath was made available. In early August a severe outbreak of coughing took place and many of the cows had a marked emphysema with all the symptoms of parasitic bronchitis. Many of the older, heavy-milking cows were the most severely affected and a few of these older animals were voiding quite a large number of larvae, but many of the fitter and younger cows had no larvae in the faeces examined. In this particular outbreak it was probable that, by the time the 28 acres of aftermath became available, the 36 acres of pasture on which the cows had been since early May had become rather bare, and although at the time of the outbreak the available pasture was ample because of much rain in August, the nutritional plane in some of the heavy-milking and older cows had become dangerously low. With the exception of a few older cows, the herd has largely recovered from the infection although the same pasture has been grazed. Additional food has been supplied and this constitutes the main line of treatment. It was interesting to note that two of the most severely infected animals were 13 years and 10 years old and had 25 and 80 larvae per gm. of faeces respectively. This does not appear to support the age incidence theory nor does it support the suggestion that the symptoms are due to the resistance which may be put up by a previously infected animal. The protagonists of the fog fever theory could point to the aftermath as being concerned in the severe symptoms in the older cows which showed all the clinical symptoms described in fog fever, but no one could deny that larvae counts such as they had must indicate the presence of a considerable number of husk worms in the lungs.

In two recent outbreaks of parasitic bronchitis in one bunch of eight yearlings and one of nine, I was requested in each case to attend a single animal which had been found ill in the field that day. Both yearlings had been brought into a loose box and the remaining animals in each bunch left in the field. In the first instance the stockman suspected woody tongue and in the second pneumonia. In neither case had the stockman been aware that all the yearlings in each bunch were coughing. The first yearling I examined was frothing at the mouth and gasping for breath. There was oedema and emphysema of the lungs. This animal died overnight. In the second case the symptoms were similar and that animal suffered the same fate: neither of these animals appeared able to cough. In both cases the lungs were sent to Weybridge for examination by Mr. Michel, who reported finding eight adult and 153 immature husk worms in the first case and 131 adults and 1,180 immature worms in the second. In both cases oedema and emphysema of the lungs was marked and the opinion expressed that the lungs were typical of so-called fog fever. In both cases the yearlings had been put on to old infected pasture for a month and then they were moved on to new and succulent grazing. In one case it was eight acres of aftermath clover and rye grass, which had been an arable field for years and was grazed only by in-calf heifers in the spring before letting-up for hay. In the second case the yearlings were moved from the old pasture on to a three acre clover ley which had been heavily grazed earlier in the summer by adult cattle none of which, however, showed any evidence of parasitic bronchitis. In both cases the yearlings had diarrhoea on the new pasture and this, I believe, was an additional factor in producing the severe symptoms of fog fever and death in an individual animal in each group of heifers. The remaining animals were not severely affected and, in fact, no treatment calculated to kill husk worms in these animals was given. After observing these three recent outbreaks of parasitic bronchitis and bearing in mind the recent work at Weybridge on the microscopical worms found in the lungs of infected animals I cannot help wondering whether fog fever and Channel Island disease may not be more closely associated with parasitic bronchitis than our knowledge hitherto has led us to believe. I would ask Dr. Taylor if he would agree that immature husk worms in the lungs might be the sensitising agent to some protein in succulent pasture.

Treatment.—In my opinion Dr. Taylor has summed up the position extremely well and I feel I have little to contribute. I

would, however, stress the importance of improving the nutrition of the animals affected and I am not convinced that this is always best done by yarding or housing the stock. Very often, at the time of year that these outbreaks occur, there is no adequate substitute for pasture available in these days of shortage of concentrated feeding-stuffs. Full consideration should be given to the epidemiology of an outbreak and an effort be made to make the best use of available pasture, augmenting this, if possible, with a concentrate ration. I do not think that one should ponder too much on the danger of infecting more pasture on the farm for, in any case, it will probably become infected to a greater or less extent as soon as it comes in for grazing. The provision of shelter may be advisable at night but I am not sure that complete housing of adult animals is either necessary or desirable, because of the lack of adequate ventilation in many sheds and therefore an increased risk of secondary infection.

The dosing of young animals with an effective anthelmintic to deal with intestinal parasites is an obvious precaution but I have seen no useful results from the use of antibiotic or antihistamine agents. Although I sincerely trust that Dr. Taylor's hope that something useful will be found to kill the parasites in the lungs may be realised, I believe the best results will come from a clear understanding of the epidemiology of the disease and the factors governing the rise and fall of the parasite population together with the appearance and disappearance of the disease.

I would again like to express my thanks to Dr. Taylor for his paper and the able way in which he has presented the subject. (Applause.)

General Discussion

The Chairman: The meeting is now open for general discussion. It must be obvious to all of you that after such an excellent start we are going to have a most stimulating and entertaining morning. I am sure that many of you are anxious to express views on this important and puzzling condition.

Mr. H. M. Wilson (Cupar, Fife): Some little time ago, we of the Scottish Metropolitan Division of the "National" had the very great pleasure of a visit from Dr. Taylor, who kindly gave us a talk on this matter in general. It is most gratifying to see now that an extract has been taken from the subject and elevated to Congress. I congratulate him on the comprehensive form in which he has given the paper, and I should also like to congratulate Mr. Bruford on the way in which he has opened the discussion.

I should like to elaborate on one or two points that have cropped up, first with regard to fog fever and similar conditions. We do not seem to experience these conditions to any great extent in Fifeshire. Perhaps it is due to lack of clinical ability, I do not know. We do, however, have some cases bearing a little similarity but they are mostly concerned with conditions of transit.

I feel that we may look to an increase in parasitic bronchitis. First, because we learn from statistics that there is an increase in the hosts; secondly, there is a greater concentration of hosts on areas due to the ploughing-up policy; and thirdly—perhaps the most important factor, though Dr. Taylor may not agree with me—there is the fact that we have always up to now regarded the control of parasitism by mixed grazing as a most important factor, and now we are losing horses very rapidly by the declining population. In Scotland the horse population is only 66,000, and they are decreasing at the rate of 8,000, 9,000 and 10,000 per annum.

With regard to treatment, one hears sometimes that cattle should be kept indoors during the first years of life. That is not always possible, as Mr. Bruford has pointed out, even in connection with the treatment of infected animals because of staffing and management conditions in local areas. For some years we in our practice have discarded intratracheal injections entirely because we believe they probably do very much more harm than good. We now rely mainly on increased nutrition, which must be a most important factor, and the use of such things as penicillin and the sulpha drugs.

I place a great deal of significance on the last paragraph of Dr. Taylor's paper.

I should just like to add that we are large-animal practitioners but like many others in a similar position we have all sorts of species as patients. Within the last week I was called to the telephone to hear a lady say that she had a tortoise which had had one eye shut for a week and had begun to open and shut the other eye; she added that the mouth was also opening and shutting, and asked if these were signs of approaching death. I was thoroughly beaten and even cautious enquiries did not elicit much help. When one of us called to see the animal in the afternoon it was dead, so now for the first time we know the signs of approaching death in a tortoise! But for far too many years and in far too many cases have we seen the distressing signs of death by parasitic bronchitis.

Mr. A. J. Kennedy (Thornhill): I must say first of all how much I have appreciated the paper and the opening. I have two enquiries which are really about the aetiology of this condition. Possibly these points have been answered in the paper, but I am doubtful; I have not been able to pick them out so far.

I should like some indication as to the months of the year when infected larvae are most numerous in the pasture. We know, for instance, there must be vast differences between the numbers of larvae picked up in the months of July and January. It is important to have some understanding of this because the prognosis in July would probably be much more serious than that in October.

My second point concerns adult larvae newly arrived in the bronchial tubes. What is their longevity or natural lifetime? All organisms have a natural period of life whether in animals or men, and I should like to know how long this parasite stays in the lung. It would be fine to be able to tell a client that at this time of the year there are not so many worms being picked up, that they are leaving every day, and that at any rate the adult parasite will not live for more than—how many weeks, Dr. Taylor?

Mr. J. R. Barker (Hereford): I should like to congratulate Dr. Taylor on a very interesting and, as he suggests, provocative paper. I find that too little time has elapsed between my reading the paper and being under the pleasant urge to speak about it. There is very much in it which disturbs the ordinary preconceived notions of the clinician. I do not think that parasitic bronchitis is a very good name. For some time past now we have looked upon it as lung worm infestation, and that name appears to satisfy much better than a problematic parasitic bronchitis.

We have the wandering of the parasite. We know that the parasite is taken in with the food and makes its way by various stages and in various periods through to the bronchial tubes, and it would appear that perhaps the clinical expression that we see depends upon the length of time it takes to pass through that cycle and the length of time it might remain in any one position. Here Dr. Taylor introduces something new for observing clinicians. It can exist in a portion of the lung and remain there without going through into the bronchial tubes. That is important for those of us who are interested in linking up that pathology with the clinical expression. I think that some confusion is caused by bringing in other conditions, such as fog fever, which rather tend to cloud the issue.

No mention is made, except by concealed reference, to age incidence. The coughing, whatever Mr. Bruford or Dr. Taylor say, will be referred to in England as "husk" and in Scotland as "hoose" just as long as Dr. Taylor and Mr. Bruford and myself are surviving, so Sir Richard Haddon and the farming community will be quite well aware of the concept we are talking about. I have no hesitation in saying that the farmer has a concept of husk or hoose being lung worm infestation. That is not to say there are not other conditions of coughing in cattle even in their first season of exposure, probably as calves.

In all probability the majority of animals receive their first exposure to lung worm infestation in the first season of their life, in July or August. Perhaps a not unimportant minority escape exposure to infestation in the first season. It is here that perhaps the ones that are so exposed acquire immunity of a positive kind.

Here I think of one word used by Dr. Taylor which is the only reference to a possible connection with fog fever. The word is "drowned." I took that word to suggest a possible oedema. There is a vast difference between the clinical expression of lung worm infestation without oedema and a lung condition with or without lung infestation and a positive oedema. An extensive oedema is the first thing found with authentic cases of fog fever, so much so that if at *post-mortem* examination one saw lungs lying side by side, uncut, it would be quite possible to say that one showed a possible lung worm infestation and another was quite certainly a fog fever lung.

We have tried to correlate the clinical pathology of each condition in adult animals, and I should like to say there should be no difficulty in saying during life that a particular animal is suffering from oedema of the lung, or that it is not so affected. I am sure there are borderline cases, and we usually refer to those as having pseudo fog fever. I have some little doubt and hesitation in saying that it is possible that the cases referred to by Mr. Bruford were pseudo fog fever.

How are we to resolve this position in differential diagnosis? It is very difficult, as Mr. Bruford has said, because while the animal is alive there can be no positive diagnosis that the condition being treated is lung worm infestation. The differential diagnosis could perhaps be resolved by co-operation at a fairly high level with the clinician and those doing the research work, by auscultation of the chest with a large phonendoscope and plotting the areas involved and maybe making a record of the sounds evolved. More particu-

larly do I think that possibly a cinematofilm could be used with a sound-track for the actual noises emitted.

I have a clear-cut impression of animal behaviour where we believed the husk worm was involved, in the first season of exposure, later on, and again in adult animals taking their first season of exposure to worm infestation—and it is just here that you get your high rate of mortality. It is, as far as we know, relatively much higher when an animal is eight or nine years old and has a first season of exposure. The mortality rate is much higher in that class of animal than in the small animals exposed in the first year of their life.

No one has mentioned much of the implication of the normal bacterial flora of the bronchial tubes in the lungs. We have occasionally been charged with the care of breeding herds with the calves running with their dams throughout the pasture, and where it is the duty of the veterinary surgeon to see that the calves go through their first season of exposure and arrive at the winter quarters intact. In one instance the cattle were very valuable, so the stakes were high. We had a death from what I might now, in view of this discussion, call a pseudo fog fever, in an adult bull. We were able to get some sputum and grow the bacteria of that particular animal. There was also a *post-mortem* examination, and we were able to recover the same organisms at death, and from that we produced a vaccine and have been able to control the first season of exposure of that valuable herd. We have been able to control lung infestation in the herd for a matter of 15 years just by that method of vaccination at the first sign of a cough in the first season of exposure.

We have also been able to secure equally good results on some other farms, using the same vaccine. On some occasions we find that we get sudden death in calves at this time of the year; animals brought in in the evening commence to cough and are dead in the morning. I am thinking of several occasions on the one farm in several successive years. At a *post-mortem* examination we found a very peculiar condition in the lung, that one portion of the lung had apparently never functioned (by the colour and consistency), a few adult worms in the bronchial tubes, and that the lung had reacted to the invader, be it a bacterial virus or with lung worm infestation larvae.

Much has been said about nutrition. One or two of the cases I have related to you concerned animals of a very high nutritional plane and it would seem to me that the parasite is unable to distinguish whether its future host will be on a high plane of nutrition or a very low one. Occasionally in herds, perhaps not so valuable as the one I spoke about, we do inject intratracheally, and sometimes the owner will come back a month after and say he has had no further trouble; on other farms we will inject and forget about it until we are called back to an animal which is *in extremis*, or possibly to a death. I would not say that intratracheal injections are of no benefit. Where the farmer is quite satisfied that his animal has recovered almost immediately after intratracheal injection then I think it is worth while.

I should like to read one part of the paper which I think is just wonderful:

Between each successive stage of development the young worm changes its skin, a curious feature concerning the two first moults being the retention of the old skins which the larva wears as an overcoat of double thickness to serve as a protection against the stresses of a free-living existence.

That amused me in the light of the discussion which has 'gone on at this Congress about the wisdom of the surgeon. Now we have worm wisdom—they refuse to discard their past president! (Laughter.)

Dr. O. V. Gunning (Acle): I feel very hesitant about speaking this morning and I should not do so but for the fact that parasitic bronchitis is the most formidable of the important diseases I have to deal with in my practice.

It has been stated that the condition is full of complexities and I must agree. In my district we graze our young animals on extensive areas of good marshland. It is an arable district, there are very few small paddocks and over-crowding cannot be considered as the cause. The disease seems to flare up in wet and also dry seasons, and the more I have to do with it the more I am convinced personally that there is more than one factor at work. If you refer to what Mönnig says about treatment, you will find he says that if the affected calves are housed and well nourished they will recover by themselves. I believe that Dr. Taylor rather leans to this view. I also believe that it is very good advice, but is not the whole answer. I find in my district that we have had many of our worst losses among calves after they have been housed and well fed, and it has not always been the worst calves that have died.

A few years ago I sent specimens from one of the outbreaks to Cambridge and Professor Blakemore kindly replied that he had been able to obtain a bacterium which resembled *B. actinomyces*. I therefore feel we are justified in concluding, as I have said before, that there is some other factor at work besides the parasite, and it may not be that the parasite merely irritates the trachea and allows the various bacteria and viruses to gain entrance. I should welcome Dr. Taylor's opinion on this point. Are we not perhaps paying too much attention to the parasite and not enough to other factors which may be causative?

One other point is that it appears to me that prevention is actually very easy. One has only to keep the calves from infected pastures and infected fodder and they will not have the disease. I have a classical illustration of that in my practice at the moment. On the same farm we have a lot of calves which have not been on to pasture at all, and they are perfectly healthy, and three other lots out at grass which are all coughing and which have the disease. This may seem a silly statement to make, but it is no more stupid than saying that animals with foot-and-mouth disease should be slaughtered.

The trouble is that the major cash crops are so attractive for the agriculturist that in his agricultural programme he does not provide for adequate food for the calves to be kept in during summer time. I believe that with our present state of knowledge one of the best things a practitioner can do is try to persuade his client to look ahead and be prepared with dry fodder for the cattle during summer months. I would not only include calves in this, because I think he should be prepared to have his two-year-olds in too.

In conclusion, I should like to congratulate both Dr. Taylor and Mr. Bruford upon their excellent papers. While I am on the platform I should like to say, as a practitioner, that I think we practitioners are very fortunate to have a man like Dr. Taylor, who has a scientific outlook and yet is always accessible to the veterinary practitioner. In spite of his science he is always able to come down with practical applications to the level of the general practitioner. (Applause.)

Mr. G. N. Gould (Southampton): I should first of all like to thank Dr. Taylor for his paper and Mr. Bruford for his very able opening. I should like to discuss husk as it is seen in my practice. Mr. Bruford drew attention to the fact that the Provisional Committee were persuaded to put forward this paper because of their knowledge of the vastly increased incidence of husk, particularly this year, and the fact that this was associated with the occurrence of the disease in adult stock in particular; in other words, with the disease more or less as a herd infection.

How far do they believe it is related to the system of husbandry in operation? How far do they believe that this herd infection is associated with the system of ley farming as opposed to the old system? Those who can look back 10 or 20 years will remember that we then met husk in heifers, and it was rarely a problem with adult stock. We had it in the heifers very nearly every year, and apparently it occurred as a sequel to heifers grazing on rather more extensive areas of pasture, particularly in wet seasons when grass was lush and the grazing season prolonged.

Now there is entirely different management on practically every farm in the country. There are the ley pastures with a far greater concentration of stock, longer periods of grazing, and herbage with much bigger leaf—much more suitable, I should imagine, to the life history of the parasite.

One is also faced this year with the fact that feeding-stuffs prices have increased considerably. How many farmers have been able to feed concentrates this year over and above what they feel the pasture is capable of producing, and how far has that reduced plane of nutrition affected the increase of husk in adult stock this year? I think we have to be extremely careful when talking about, and drawing a distinction between, the plane of nutrition and the condition of cattle. I have seen husk this year in cattle of all ages which are in quite good bodily condition, and Dr. Taylor has seen one of the herds with me. The problem seems to be related, in some instances, not to the actual bodily condition of the animals but to a fall in the plane of nutrition around the time when the outbreak is occurring. Because animals are in good condition it does not mean that they will not get husk if they are exposed to infection, if the plane of nutrition at that time is inadequate.

Reference has been made to possible carrier animals. It happens that we have fairly accurate statistics on one farm on which every animal except two has been involved in a husk outbreak. They were, I believe, 10 and 11 years old, and they were both involved in a husk outbreak nine years ago when clinical husk last occurred on the farm.

Usually in an outbreak the trouble starts in the down-calving heifer and then it spreads to the rest of the herd, if the grazing methods permit the spread of infection. This history appears to be fairly constant in the husk we have had in the last year or two, but whether it has any particular significance beyond indicat-

ing that group of animals which is the least resistant at the time of exposure to infection, I do not know.

Mr. Bruford has referred to the fact that it is practically impossible for people to bring stock in and put them in the yard to feed. On most farms, I agree, it is quite impracticable, and we have had to give it up. If they have got anything else to feed, it is too expensive or the labour required to feed in yards is not available or too expensive. We have instituted a system of alternation of grazing of pastures which appears to have been beneficial; limiting grazing to one week and allowing a rest period of four weeks before the next period of grazing on that land. Pneumonia is a frequent complication, particularly where stock have to walk from distant pastures to the milking shed or yard. It is possible to trace nearly every case of pneumonia we have had in a recent outbreak in one herd to the travelling from a distant pasture.

It is my view that we have to take a very great and keen interest in pasture management. Grass growers are gradually getting down to all-round-the-year grassland. They do not appear to have the slightest idea of the problems they are creating for us and the farmer. I think the time is opportune to seek a much closer liaison with them and for us to see how much we can contribute by advising the farmer on how he can manage the swards being grown, which have much greater stock carrying capacity. I do believe that we have a vast contribution to make to this management, and I think the time is opportune for this profession to make that more widely known.

Mr. J. B. White (Salisbury): I come from Wiltshire and from what I have heard I imagine our system of farming must be on the lines of that in Mr. Gunning's area. On the whole the farms are large, with not such excessively heavy stocking as there is in some parts. In spite of that, it is almost entirely ley pasture as mentioned by Mr. Gould, who is a little south of us.

The problem of husk as we see it is still mainly the husk of the young animal, the old-established type which we well recognise. I was very glad that Mr. Barker suggested we should not cloud the issue too much with this acute fulminating type of lung disease which is possibly attributable to husk larvae.

Many of our herds are herds rearing a large number of calves and down-calf heifers, and the animals which suffer most severely from husk are the calves which go out in the spring. Older animals get the husk but generally it does not worry them exceedingly and provided they maintain their condition I do not advise that anything should be done about it. It is the younger ones which suffer from pneumonia, possibly coupled with parasitic gastritis, and die. Our problem is to try to institute for the farmer a system of management by which he can avoid that, and it seems to be exceedingly difficult. When the youngsters go out in the spring it is surprising how difficult it is to find ground for them which can be guaranteed free from husk infection until aftermath becomes available.

On one of these rearing farms where parasitic bronchitis has not been excessively severe this year, we encounter husk every year consistently. This year the owner fed concentrates to the youngsters right through the summer, but in spite of that they still got husk. I am wondering whether the decrease in the sheep population has anything to do with the increase of husk in the cattle population. Can Dr. Taylor tell us whether sheep can be used in any way to clean pasture of the husk worm for cattle?

Three years ago when we had a really dry summer some water-meadow land was used for the first time for many years for young stock. It is always considered very bad practice locally to put young stock on water-meadow land but in that year grass was exceedingly short. The result was really severe husk. The water-meadows had not been used by anything except adult stock for possibly seven years and even then only during the summer months owing to the flooding of the meadows in winter.

Mr. Gould said he thought that the acute form of pneumonia in adult stock which some people are seeing this year—we are not—seems to be a rather fresh development. I can remember when I was an assistant in Falmouth nearly 24 years ago seeing just the same cases, so it is not entirely new. The acute case in the adult cow seems to be seen in the imported Jersey cow, which as we all know is very susceptible and gives a very acute picture.

Dr. J. T. Edwards (London): Before attempting to piece together the information we have available, I should like to pay a special tribute to my old friend and colleague, Dr. Taylor, for the excellence of his remarks here to-day. As we know, he approaches his subject always from a very high intellectual level and he takes moreover a keen and catholic interest in all natural history. Seldom, too, in the course of the last 40 years have I heard anyone open a discussion so well as our friend Mr. Bruford, and never have I heard anyone open one better. The remarks, indeed, we have heard here this morning from all the speakers have been most constructive and instructive. What I should like to do now is to see if I can piece together the bits of the mosaic, as it were, from an experience lasting some years in the examination of lungs from the standpoint of a bacteriologist and virus research worker, as well as of a histologist.

We are far removed from the day when we were certain that *Dictyocaulus viviparus* was the sole cause of "husk" or "hoose," and that the treatment was a simple empirical one such as intra-tracheal injection and so on. We now realise there are several possibilities besides the worm in the production of symptoms of chronic cough, which is usually seasonal, not only in the bovine species but in several other species, the bovine being by no means the most interesting species.

I should just like to pin-point the remarks I wish to offer around two somewhat striking statements made in the course of the discussion. One was made by Mr. Barker: at first sight, his statement respecting vaccine treatment would savour of empiricism. But, on looking into it more deeply one comes to realise more and more that there may be something very substantial in it. The other statement was one made by Mr. Bruford in which he contended that he had never seen this condition in cattle spread like the corresponding one we well know to prevail occasionally among horses—infectious bronchitis—and therefore the two syndromes cannot arise from the same cause.

Let me take first the statement made by Mr. Barker, that a protection can be set up against "hoose," or what we have presumed to be simply parasitic bronchitis, in cattle by the employment of a bacterial vaccine. That is possibly, I will not say certainly, quite sound. But there is one set of premises leading up to the elaboration of his practice which is not entirely well-founded: that is (speaking from my own somewhat extensive examinations over some years), there is really no such thing as a "*normal*" bacterial flora of either lungs or bronchi or even of the nasal mucous membrane. Somehow or other, in the perfectly healthy animal, the mucous membrane from the very beginning of the respiratory tract is able to manage to keep out all non-pathogenic bacteria. If there are any present they must be regarded in the light of "*sub-pathogens*." That is to say, they are not "non-pathogens," but potential "pathogens." And so with a little gingering-up they can become pathogenic. Whether that gingering-up takes place through the secondary action of a worm, or of a virus (as in swine fever, and swine influenza) or in some allergy (as, possibly, in "fog fever") or through a variety of other causes (such as those which Mr. Gould, with his usual keen powers of field observation has brought out so well before us)—it is often very hard to tell. It may be any one of these agencies, or it may be several of them, in combination.

One finds, particularly with the sub-pathogens that secure lodgement in the respiratory tract, that if one keeps animals in conditions under which respiration becomes depressingly affected (as when the animals are confined in surroundings made unhealthy by dampness in particular, that is, by cold and a high relative humidity) then when one proceeds to examine a large number of individuals of given species, up goes, one finds, the incidence of invasion with the respiratory sub-pathogens, clinical bronchitis and broncho-pneumonia, and of the death-rate from the sub-pathogens themselves. Then, when one examines the lungs, one will find there bacteria, usually in rich pure culture, often accompanied with parasitic worms. The convenient little animal for investigating this phenomenon with which I have had most experience is the hedgehog (in the course of foot-and-mouth disease research), but I believe the phenomenon to occur universally in all other species. In that little animal the common bronchial sub-pathogen was *Brucella bronchiseptica*, but, in severe fatal disease, *Pasteurella* and even haemolytic streptococci could be identified in the upper respiratory tract. Inoculation with appropriate "autogenous" vaccine, in such circumstances, could be anticipated to raise the threshold of the animal's response to invasion with some (at any rate) of these sub-pathogens.

As I said last year, at Cardiff, after listening to Mr. Wright speaking upon his experiences in vaccination against bovine brucellosis, one must never, as a research worker, dismiss lightly what is reported as the outcome of sound field observation by the practitioner. Certainly, one ought never to dismiss it as something to be brushed aside as mere empiricism at its worst.

In regard to Mr. Bruford's remark that a virus can be ruled out as a cause in the bovine complex, I would like to say that in working with those viruses which cause respiratory disease one can never be certain whether or not, and to what extent, they are implicated. One finds they vary enormously in their properties. That variation is brought out strikingly in human influenza. In a great many outbreaks of influenza one may come across strains that do not readily spread and are hard to isolate. On the other hand, in other outbreaks, one discovers strains that spread easily

and can be isolated too with great ease, by intranasal inoculation of ferrets, mice, and so on. Such variations in virus strains are, of course, well known to occur in rinderpest and foot-and-mouth disease, where occasionally one may get virus strains that are highly epizootic but feebly pathogenic, and *vice versa*, and, indeed, in all grades of relations as between these two properties.

I was particularly struck by the report of the original work done by Waldmann and Köbe about 1937 or 1938, upon the coughing disease (*Hoppegarten Hüsten*) observed by them among race-horses in Berlin. These workers successfully demonstrated the virus in the lungs of affected horses by intranasal inoculation of filtered lung suspensions into healthy horses. Being expert virus workers they did not rest content with that finding, but attempted to infect other species with the material in the same manner. To their surprise, they produced an infectious bronchitis, but of a somewhat mild type, in cattle. It is quite likely that by further serial transfer in cattle the virus could be so well adapted as to become raised to the status of a highly epizootic and pathogenic bovine strain.

One would like to know if in those localities where the bovine coughing disease occurred, there also prevailed a similar disease, even of a mild kind, simultaneously among the horses. One would like, too, to know whether it is generally the impression among practitioners that this year—which has been unusually cold and damp, and has been the sort of year when one would expect the virulence of the bacterial respiratory sub-pathogens to become enhanced—has been, too, a correspondingly "bad 'hoose' year."

There are all these, and other, possibilities to consider. I hope I have said, as a laboratory worker on these different aspects, enough to suggest the possible final pattern of the mosaic. But there, in that matter, we may feel sure that in the competent hands of Dr. Taylor and his colleagues—perhaps after they have had occasion to change their minds several times again within the next few years—we will, in the end, learn from them the truth. Dr. Taylor has confessed, with his usual frankness and intellectual honesty, that he has already changed his mind in the course of the past few days: which merely goes to prove that he has a mind to change.

Mr. J. R. Barker: May I say that I made no such statement as that referred to by Dr. Edwards.

The Chairman: I will now ask Dr. Taylor to reply.

The Reply

Dr. E. L. Taylor: As I knew it would range over a very wide field, I thought that the best way of dealing with this discussion would be to reply in the form of second thoughts of my own and to work into that a reply to the points that various speakers have raised. I might begin by the observation that if it is a discussion one wants then of course it is a very good thing to know nothing about the subject which is being discussed! It is only under those circumstances that there is ample room for the play of opinion and a discussion can be held that goes on for hours as I am sure this one might have done. If there is any real knowledge—as, for instance, about the association of germs with disease, or on the spherical shape of the earth—then there is nothing to discuss; so we might regard ourselves as being in a very advantageous position this morning!

Mr. Bruford put his finger very neatly on the points that really matter. He also referred to the present confusion. This has been amply confirmed by the contributions that we have had leading up to Dr. Edwards's "threshold of sub-pathogens" which begins to make things seem very difficult indeed. Of course, I am sure they are so, and as our discussion progressed we seemed not to clear it up but rather to lead into further obscurities.

One of the points which Mr. Bruford specifically mentioned was the important question we have to try to answer: Are we dealing with one disease or three? I am afraid we have not come to any very clear conclusion but it seems to me that the general impression one would get from this discussion is that there are certainly more than one. There are possibly more than three. For instance, how is it that in an area like Mr. White's there is still husk occurring in the old traditional sort of way among the young stock, while the older animals escape? Then Mr. Gunning's experience is that many of the worst outbreaks he sees are on very extensive pasture—differing markedly from what seems to have been Mr. Gould's experience. Mr. Bruford referred to a specific outbreak in which two of the worst affected animals were the oldest in the herd and later Mr. Gould referred to an outbreak in which the only two animals to escape were the two oldest animals in the herd. Mr. Barker distinguishes three diseases, true husk, fog fever and pseudo fog fever, and Mr. Gunning thinks we do not pay sufficient attention to the bacterial organisms, such, presumably, as Mr. Barker was dealing with in his interesting and successful vaccine. And even that list does not exhaust the ideas that have been discussed.

I appreciated very much Mr. Bruford's reply to my challenge concerning the diagnosis of husk on the coughing symptom. I think there is a very great deal to be said for it so long as it is taken in conjunction with the history of the outbreak. I should like, however, to refer to a few lines which I will read from an early part of my paper where it is said that "there is an undoubted tendency, amounting almost to a general practice, to diagnose parasitic bronchitis on the presence of this coughing symptom alone; but, although it may be regarded as presumptive evidence where circumstances are in conformity with the disease, it would appear to be an unwarranted assumption in the face of contrary evidence." In that respect I have come across a number of diagnoses of parasitic bronchitis among cattle which are and have been housed right throughout the winter. In those circumstances it seems to me the history does not back up the diagnosis at all and it would be unwarrantable to make a diagnosis on the coughing alone.

Referring again to Mr. Bruford's opening, he asked the question: Might not the larvae invading the lung in some way be the trigger mechanism for giving rise to the symptoms where the real cause is something of a chemical nature taken in from the grass? Undoubtedly that is a possibility. The larvae might also act as a trigger mechanism with some sub-pathogenic organism, and so we might endlessly increase the complexities for our consideration. We have now improved our laboratory aid to diagnosis a little so that we can detect one larva in 10 grammes of faecal material instead of only 1 gramme. That will improve our chances 10 times in finding more infected animals. I think the recommendation at the present time would be to attempt to make a diagnosis on a herd basis rather than in individual animals, so that if the history is a fitting one and one examines samples of material from a number of animals and finds any larvae at all to be present then one would be pretty safe in making a diagnosis of parasitic bronchitis.

One of the points raised in general discussion has been the length of time these worms remain alive in the lung of the animal. It would be very nice to be able to say exactly how many weeks. In answer to that question I might perhaps refer to a present suggestion put forward by my colleague Mr. Michel that this parasite *Dictyocaulus viviparus* when present in cattle is a parasite in its wrong host, and on that account it does not stay there for very long. One of our difficulties in working with this parasite at Weybridge is that of infecting cattle experimentally; they either die because of too big a dose of larvae or they recover and throw off their infection so that we lose our material. A suggestion at the present time is that we should begin to work with deer instead of cattle because in all probability *Dictyocaulus viviparus* is a natural parasite of deer, which ought to be more easily infected and to carry the parasite for a longer time such as we know to be the case with *D. filaria* in sheep. Of course, if one wants to tell pretty or interesting stories to a client there are a lot of nice things that can be said about longevity of parasite worms in general. It is amazing, for instance, how some tapeworms in man live for 20, 30 or 40 years, and the hookworm also for several years. It might be said of the tapeworm that if one is infected with such a creature one has a friend for life! That is so, because there is no immune response that ousts the worm; and a useful way of looking at the longevity of some of these parasites is to regard them as capable of living for years unless some immune response in the host operates against them. Their length of life therefore depends very much upon the condition of the individual host in which they are living. They do not die of old age, they are ousted by the immunity mechanism of the host.

Another very important point to know something about is the length of time this worm can live in the pastures. Mr. Gould made some mention of that. He thought that perhaps the rotation of animals round the pastures is a good way of checking the rate of infestation. We are carrying on some experiments in that connection at Weybridge at the present time, and we find that the larvae die out quickly as compared with stomach worm larvae. At the end of a month we find that the numbers of living larvae have fallen to about 1 per cent. of what they were at the beginning of the month—that is, of course, where their numbers are not being added to as would be the normal course of events in a field freshly vacated by cattle and where the development of infective larvae was still proceeding. A very small minority will live for much longer than the rest but the acute danger will have passed within a month, or say six weeks, if one allows a little longer for the preinfective larvae to reach the infective stage.

Then one should consider the important point as to where these

worms survive the winter: is it in the pasture or is it in the stock? That is a difficult point to settle; in fact, one cannot make any sort of pronouncement at the present time. Observations such as those carried out by some workers in Germany show it does not over-winter in the pastures in that country. We have made frequent searches in the faeces of cattle in our own country during the winter time but have found little evidence of it over-wintering in the cattle. It is our present opinion, however, that occasionally some adult animals, and very frequently young animals, can carry the parasite right through the winter and that they reinfect the pastures in the spring. Perhaps our improved technique for the recovery of larvae from faeces will show this to occur more frequently than we had thought. We have quite a lot of evidence from the field, however, suggesting that infestation of pastures can be built up very rapidly if infested animals are grazing there.

There are one or two points of a more general parasitological nature. First of all, in working in parasitology one soon begins to appreciate the great complexity of host-parasite relationships and to get a feeling for the wonderful way in which the one is adapted to the other. We know that where parasites are very widely distributed they have learnt to live happily with their hosts. I have coined the term "Happy worms in happy sheep" which gives some sort of indication of the nature of the normal relationship. They cause disease only when present in unnaturally large numbers.

How far does that apply to husk I wonder? With regard to husk in the typical form, presumably it is quite a straight and parallel sort of relationship: the more worms the worse the husk. With the other disease, the coughing disease in adult cattle, that relationship may not be so obvious. The difficulty when one comes to try to explain the occurrence of the disease is, the reason why, if the parasite is there all the time, it sometimes sets up disease and sometimes does not do so. Our epidemiological line of enquiry is endeavouring to solve such points as this.

Another point of a general parasitological nature is that of the likelihood of a disease being caused because a parasite is in its wrong host. In the discussion yesterday, Dr. Edwards referred to malignant catarrh in cattle which provided another example, new to me, of an organism causing a severe disease when in its wrong host. I have already referred to a theory concerning *Dictyocaulus viviparus* being, originally, a parasite of deer, but might now add to the reasons previously given the pathological effects which the larvae sometimes appear to produce in the lungs of adult cattle. One might suppose that foreign larvae, or ill-adapted parasites, would be more likely to produce this reaction than would those that are well adapted.

It might be advantageous to refer to the conclusions of Webster and co-workers on the various types of epidemics that occurred among their colonies of mice. They defined three types, first, those epidemics due to the introduction of a virulent parasite to a susceptible community. Those are the kinds of epidemics we are all familiar with in outbreaks of foot-and-mouth disease or measles in man and such like. But what about parasitic bronchitis in cattle? I wonder whether perhaps that kind of outbreak, due to the fresh introduction of a virulent parasite, does not really occur in parasitic bronchitis? I am beginning to think that perhaps it might, although I never used to think so.

The parasites are widespread and I think that possibly under the older systems of management of grazing it would be quite rare for any groups of cattle to be free from infection with *Dictyocaulus viviparus;* but I am not so sure that that generalisation would hold now under some of the newer systems where grassland is very intensively managed. The plants themselves are greatly improved, and the soil made much more fertile so that many more animals can be kept on a small amount of ground. I find on quite a number of dairy farms in the south that the adult milking cows have their own part of the farm; they go round their own pastures that are not grazed by the young stock and may therefore escape infection for a series of years.

In thinking at this moment of the outbreak referred to by Mr. Bruford, where severe atypical parasitic bronchitis broke out among the milking cows, it might perhaps have been explained by the introduction of a virulent parasite to a susceptible community. Those cows had been alone for years; they had never been on the same pasture with young animals. They had lost the specific resistance that they acquired when young but had been left with a sensitised lung. When the two-year-old heifers come to the cow pasture they are as a rule free of infection, but perhaps on this occasion one or two heifers came through carrying infection. They might introduce it to the very lush pasture on which the larvae would develop well under the clover plants, and so we had a fulminating outbreak of parasitic bronchitis. I think therefore it would be possible for this type of epidemic, through the introduction of the parasite to a susceptible community, to occur in parasitic bronchitis. The only two factors there concerned are susceptibility and infection.

The second kind of epidemic which was defined by these workers in experimental communities of mice is that resulting from an increase of the dose of the infective organism. That type might easily come about in parasitic bronchitis as, for instance, in the unusually plentiful development of larvae in the pasture. The farmer carries out some operations that make that more likely, or the weather does something to help the larvae to develop in the pasture, then the dose goes up and disease results. Mr. Gould referred to ley pastures assisting larval development. That undoubtedly could have a marked effect in increasing the intake of larvae, as would the crowding of stock on to the improved herbage. What Mr. Wilson has said about the disappearance of horses, and Mr. White about the decrease in the sheep population might also operate in increasing the larval intake by cattle, since the assistance afforded by mixed grazing in cleaning up the pastures would thereby be greatly reduced. Mr. Gunning's point also comes in here, that farmers should make better provision for times of shortage of pasture by growing more cattle food to use in times of summer shortage when over-crowding or over-use of certain pastures might otherwise increase the rate of intake of larvae to the danger point.

Webster and co-workers' third type of epidemic is that due to the lowering of the resistance of the already infected community. I think there can be no doubt that this type of epidemic is of common occurrence in helminthic disease and probably also in parasitic bronchitis. Where the parasite is present in a herd of cattle and the young animals acquire some resistance through infection early in life there may be little trouble so long as a state of good nutrition is maintained. If, however, that nutritional state is suddenly lowered, as is suggested by Mr. Gould and also referred to by Mr. Bruford, then the parasites have a chance of getting hold and increasing to such an extent as to develop the disease.

Finally, I should like to express my complete agreement with what Mr. Gould said on the importance of workers in the veterinary field taking a keen interest in the new developments in grassland farming. The association between pastures and disease is particularly clear where helminth parasites are concerned and it is for us to keep ourselves familiar with the important changes that are taking place and to be ready to advise where new methods begin to interfere with health.

The Chairman: I am sure you will agree with me that we have had a most interesting and instructive session. Also I think you will agree with me that we are all very sorry that more time could not be given to the speakers to enter into further discussion on this subject. I can assure you, Dr. Taylor and Mr. Bruford, that we have thoroughly enjoyed this morning. You can gauge how much it has been appreciated by the very keen and stimulating discussion which has come from the floor.

I will not say anything further except on your behalf, ladies and gentlemen, to extend to Dr. Taylor, to Mr. Bruford and to the members who have spoken our sincere thanks, and to propose a very hearty vote of thanks to them all. (Applause.)

NATIONAL MILK YIELD COMPETITION

At a recent function in London Lord Waldegrave distributed the prizes won by dairy farmers in a National Milk Yield Competition organised by the British Oil and Cake Mills, Limited. He said there was not a dairy farmer in the country who was not wondering how he would get through the winter because of the shortage of cattle foods. At the moment there was being distributed in this country only about two-thirds of the pre-war amount of protein food, and about half of that was coming from Argentina. Only about half the pre-war amount of carbohydrates was being distributed, and, similarly, he believed that half of that supply came from behind the Iron Curtain.

Lord Waldegrave disclosed that the first prize in the open class had been won by Fyfield Estates, Limited, the *nom de plume* of Mr. R. S. Hudson, who as Minister of Agriculture during the war had done more than anyone, said Lord Waldegrave, to lift agriculture out of the mire into which it had fallen as a neglected industry.

CLINICAL COMMUNICATION

TREATMENT OF DISTEMPER IN THE DOG WITH AUREOMYCIN

R. P. JONES, M.R.C.V.S., JIT WORAMONTRI, B.V.SC., AND POON NITIYASUTI, B.V.SC.,
BANGKOK, THAILAND

In the April, 1951, issue of the *Journal of the Veterinary Association of Thailand* the writers recorded their impressions on the treatment of distemper in the dog by the oral administration of aureomycin. The opinion submitted there, based on over 300 cases of distemper, was that treatment with penicillin, mainly procaine penicillin in oil in adequate dosage and at the interval recommended, combined with sulpha drugs, exerted little, if any, beneficial action, except that penicillin injections definitely cured the pustular dermatitis so often associated with the disease.

During the first three months of the year 31 cases of distemper diagnosed on fever, muco-purulent nasal and ocular discharge, with or without other complications, were treated with aureomycin. Of these 31 dogs, 26 made a rapid recovery. Four developed paralysis and were destroyed. In only one case did natural death occur. This was a severely ill dog with extensive broncho-pneumonia and watery diarrhoea. Aureomycin was given for three days during which there was slight improvement. Supplies gave out and the dogs' condition became aggravated.

Following administration of aureomycin the dogs in this series regained their health in three to six days, sometimes by the second day. Six dogs were "in," the rest were "out" patients.

Between April 1st and May 22nd, also of this year, 26 more cases were treated, 16 with aureomycin alone, seven with serum (B.W. & Co.), followed at once with aureomycin and one by serum, with aureomycin being delayed for two days. Two other dogs which had received prophylactic doses of serum as they had been exposed to infection developed symptoms, one four days and one 10 days later. They were then given aureomycin.

The following are the results of this second series :—

(1) Recovery after	2	days	aureomycin	alone	treatment		3
(2) "	"	2	"	"	+ serum	"	4
(3) "	"	4	"	"	alone	"	4
(4) "	"	4	"	"	+ serum	"	6
(5) "	"	6	"	"	alone	"	2
(6) Deaths	"	6	"	"	alone	"	7

All dogs in (6) developed paraplegia.

Whether serum in curative doses in the early stages combined with aureomycin is a more satisfactory treatment than aureomycin alone is impossible to judge from these few cases. The use of serum is more rational and perhaps some significance should be attached to the fact that none of the dogs which died (of nervous symptoms) received serum. Our conclusion, so far, is that aureomycin is quite useless when the nervous system becomes involved. We consider if aureomycin does not cause a great improvement with decline of temperature to normal, or very near normal, in six days' time it is useless to push it further, for it would seem that continuous fever is an indication that nervous symptoms sooner or later will develop. This is what happened to the 11 dogs in the two series in which aureomycin had no influence on the temperature.

Some explanation is necessary as to what is meant by "recovery" in these cases. Most of the dogs were "out patients," they improved greatly within our observation with decline of temperature to normal and were later reported on by the owners who stated that, so far as they could judge, the dogs had regained normal health within the times stated.

Aureomycin was dispensed in capsules, one capsule every five hours with a total of three capsules daily. The dose varied from 83 mg. in each capsule for a dog about 20 lb. weight to 125 mg. for a fully grown Alsatian. This is less than the dose recommended by the Lederle Laboratories, who advocate 25 mg. per lb. bodyweight daily either as a single dose or divided, and 15 mg. per lb. bodyweight per day in early cases of disease. The lower doses seemed satisfactory.

This is a broad outline. Treatment with aureomycin requires more careful checking than we have so far been able to give it. It is certainly worthy of a more extensive trial. It has provoked in us a much greater sense of confidence in dealing with distemper cases, except when nervous symptoms develop. Then we feel quite hopeless.

REVIEWS

[**Parasitic Animals.** GEOFFREY LAPAGE. (1951.) XXII + 352 (113 text figs.). Cambridge University Press, 200, Euston Road, London, N.W.1. Price 21s. net.]

On first handling this book one instinctively says "This is just the book I have been looking for."

The author is already well known for his literary ability and one is not surprised to discover philosophy mingled harmoniously with descriptions of many of the parasites with which we have become all too familiar in the veterinary field. Whilst not overlooking the depredations, the damage and the ill-health which most of these parasites are capable of causing, the author takes the standpoint of a beneficent observer and readily sees beauty and the guiding hand of some invisible power in some of the most phenomenal adaptations that are exemplified in many of the life histories. We cannot help but admire the beauties of creation even if we are at times afraid of their implications.

A large number of endo- and ecto-parasites are dealt with in detail and beautifully illustrated, but in addition there are chapters which have an even greater appeal, dealing with the general effects of such parasites on their hosts and the modern methods of controlling the devastation of such individuals. To read this book is certainly to study parasitology without tears. Most of the parasites dealt with have veterinary implication and the book is so written that it will be as valuable to the practitioner as to the student and also provide very good reading for the interested layman.

* * * * *

[**Wild Mammals of the Land.** Bulletin No. 150 of the Ministry of Agriculture and Fisheries.]

An excellent bulletin, amply illustrated with exceedingly good photographs. As stated in the introduction, the purpose of this bulletin is to record the results of an attempt to discover which of the wild mammals are beneficial and which are harmful. This rather controversial question has been very adequately dealt with in a most comprehensive manner. The judgment given on each animal has been arrived at only after a careful consideration of its proved and known habits. Folk lore and opinions on this question have been, very rightly, rejected. This bulletin is commended to all those who have the interest of our wild mammals at heart but perhaps more especially to those whose employment entails the destruction of many of them, in the hope that the prejudices which exist concerning their harmful effects may be seen in their true light.

ABSTRACTS

Varieties of *Mycobacterium johnei* Isolated from Sheep*

The author describes the isolation and characteristics of acid-alcohol-fast organisms from the intestines of sheep affected with Johne's disease originating from Scotland and Iceland. Three strains were found, including the classical type of *M. johnei* (bovine), the other two being regarded as probable varieties thereof. Of the latter, one was a type peculiar to Iceland and the other, a highly pigmented strain, was found in cases originating from the North of Scotland. The claim is made that this constitutes the first successful isolation by cultivation of the last two strains. This is considered to be due to the use of the author's modified Finlayson's medium with egg yolk as a major ingredient. It is apparent from this work that classical *M. johnei* differs from the other types in that growth of the latter is unlikely on egg medium containing less than 50 per cent. yolk, whereas the former is satisfied with 25 per cent. The distinct pigmentation of the colonies and of the affected tissues in infected sheep suggests that the third type is a special one to which the author has previously applied the name "ovine" type. Pathogenicity tests revealed no difference to exist between types as judged by the response of test animals to avian and mammalian tuberculins and by lesions noted at autopsy.

W. T. R.

* **Varieties of Mycobacterium johnei Isolated from Sheep.** Taylor, A. Wilson. (1951.) *J. Path. & Bact.* **63.** 330-333.

* * * * *

Vaccination Against Newcastle Disease*

The authors have investigated the possibility of using the avirulent B_1 strain of NDV, which successfully immunises chicks by intranasal inoculation, to immunise birds by subjecting them for some minutes to an atmosphere containing (1) atomised and (2) nebulised vaccine. Such methods, if safe, should be labour-saving and more uniform. In 13 experiments involving 8 to 2,850 chicks of one to two days old no losses were attributable to the method of vaccination. The immunity developed compared favourably with that produced by intranasal inoculation.

A. W. G.

* **Vaccination Against Pneumoencephalitis (Newcastle Disease) by Atomization or Nebulization with the B_1 Virus.** Johnson, E. P., & Gross, W. B. (1951.) *Vet. Med.* **46.** 55-59 (2 refs.)

* * * * *

Intravenous Use of Formalin as a Haemostatic*

Blood from 20 apparently healthy native dogs showed an average coagulation time of two and a half minutes. Fifteen minutes after the intravenous administration of 5 per cent. formalin in distilled water at a dosage of 1 c.c. per kg. bodyweight the clotting time fell to an average of 23·35 seconds, slowly rising thereafter to pre-injection level in three to four hours.

Comprehensive figures of the coagulation rate, following the slide method suggested by Kolmer and Boerner, are given.

As a practical application of this technique J. E. Fieser (1947) claimed (*Vet. Med.* **42.** 315) to have treated successfully, with immediate results, 20 cows giving bloody milk by administering intravenously 500 c.c. of 2 per cent. formalin solution.

J. P.

* **A Study on the Intravenous Use of Formalin as a Haemostatic in the Dog.** Gonzaga, A. C., & Gabuten, A. R. (1951.) *Ind. Vet. J.* **27.** 411-416.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address. It is regretted that consideration cannot be given to questions for which solely a private reply is required.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Determination of "Calved"

Q. 402.—*The question frequently arises at markets and slaughterhouses as to whether an animal reputed to be a heifer has actually had a calf.*

What are considered to be definite signs that such an animal has delivered a calf?

A.—It is often extremely difficult to decide definitely whether or not an animal has produced a calf, and the decision will have to rest on an attempt to assess various points. The condition of the udder, and still more its secretion, often will give a pointer, but it should be remembered that quite marked mammary development can occur when an animal has not been pregnant. Lactation in the young and non-pregnant animal is quite common and has been recorded in newly born foals and calves.

If the animal has calved comparatively recently the size and feel of the uterus will be of assistance. Probably the most reliable signs are evidence of laceration of the cervix when viewed with a vaginascope or on *post-mortem* examination, and the ease or otherwise with which a well-lubricated hand may be inserted into the vagina of the live animal. It should be remembered that in animals, especially of the smaller breeds, which are not pregnant and which have not produced a calf for some time, the vagina may contract considerably, particularly if the calf was premature or mummified.

* * * * *

"Blood in the Milk"

Q. 403.—*I am experiencing difficulty in treatment of cows and heifers giving blood in their milk. No organism has yet been found which might be blamed, and the trouble seems to occur at any stage of the lactation, ranging from about a fortnight before calving in the case of maiden heifers, to five or six months after calving.*

All the cases so far have occurred whilst the cows have been at grass. The amount of blood present varies from just sufficient to make the milk pink to a concentration in which there is more blood than milk.

I would be very pleased to hear of any effective treatment.

A.—Whilst none of the accepted mastitis-producing organisms may be found, there may be others which are responsible for an inflammation resulting in a vascular breakdown. It would be worth while in these cases to request that the milk sample be submitted to a test, such as the Hotis test, which does not rely on any particular bacterium for its efficacy, but is related to the cell count. This may be more significant under the circumstances. Having thus eliminated the possibility of a mammitis, that of some form of poisoning should be considered. There are several other possibilities—physiological, traumatic, etc. —but there appears to be a lack of information on the subject.

In a reply to this question given in *J.A.V.M.A.*, it is stated that formalin is often successful in stopping haemorrhage* and likewise antihistamine drugs may be used, especially

* See also final paragraph of last abstract in this issue.—*Editor.*

rutin ; also that urotropin can be used in small, sustained doses.

When possible, a drastic reduction in the ration should be advised for the time being, the cow being brought slowly back to normal when improvement is observed.

* * * * *

Docking of Dogs

Q. 404.—*In what breeds of dog is docking permissible? What is the correct site for the operation in these breeds?*

A.—By " permissible " the respondent takes it the questioner means according to the accepted breed standards, since docking is legally permissible in any dog.

The Kennel Club breed standards are by no means uniform in that many do not specify any particular points for the tail, nor do they indicate if docking is usual, nor the length the tail is required to be.

It is perhaps safest to say that docking is *customary* in the following breeds ; where a length is specified or indicated by the standard this is added beside the breed ; if no length is specified the *usual* dock is given.

1. *Non-Sporting Breeds*

Boxers. The tail should not be more than 2 inches long. (This is in the mature dog and it is usual to dock behind the second coccygeal vertebra.)

Old English sheep dogs. As short as possible ; many are born tailless.

Poodles (standard and miniature). About half and half ; in bitch pups length may be judged by docking at the point where the tail covers the vulva when held down by hand.

Schnauzers. Three joints to be left.

Welsh Corgis (Pembroke). As short as possible.

2. *Gun Dogs*

Clumber Spaniels. No length specified ; about the same as other varieties of Spaniel.

Cocker Spaniels. Standard states " not docked too short " ; one-third usually left.

Field Spaniels. Standard states " not docked too short "; one-third usually left.

English and Welsh Springer Spaniels. Standard states " not docked too short " ; one-third usually left.

Sussex Spaniels : Standard states " should be docked from 5 to 7 inches."

3. *Toy Breeds*

Griffons Bruxellois. Remove two-thirds.

Cavalier King Charles Spaniels. Docking optional.

King Charles Spaniels. No length specified.

Yorkshire Terriers. Medium length ; usually leave just over one-third.

4. *Terriers*

Airedales. Remove one-third.

Australian. Leave about one-third.

Fox Terriers (wire and smooth). Remove one-quarter to one-third.

Irish Terriers. Remove one-quarter to one-third.

Kerry Blues. Remove one-third to one-half.

Lakelands. Remove one-quarter to one-third.

Norwich. Medium, usually one-third to one-half left.

Sealyhams. Half and half.

Welsh. Remove one-quarter to one-third.

Correspondence

Car Sickness in Dogs

Sir,—I was interested in the information given in the October 27th issue of *The Veterinary Record*, " Questions and Answers " column, regarding prevention of car sickness in dogs.

On the occasion of the original contribution to this problem in Question No. 393 of your June 2nd issue we were conducting clinical trials with " Avomine " in dogs and cats. " Avomine " is chemically promethazine-8-chlorotheophyllinate and it has provided excellent results in cases susceptible to motion sickness.

There is no adequate explanation of how this therapeutic agent acts in the prevention and symptomatic treatment of nausea and vomiting and its therapeutic action is probably dependent on a central depressant effect. This, too, permits a rapid adaptation or acclimatisation to the disturbing motion of car journeys, sea trips, etc.

The dosage we have found to be most satisfactory in dogs of 25 lb. bodyweight is 1 × 25 mg. tablet given the night before travelling, and since there is a well-maintained therapeutic effect the dog seldom needs to be treated during the 24 hours after original administration. In some cases a soporific effect is produced.

In humans, " Avomine " has been widely used for travel sickness, and particularly as a preventative against sea sickness, with successful results.—Yours faithfully, J. A. Anderson, Veterinary Division—Information Department, Pharmaceutical Specialities (May & Baker), Ltd., Dagenham, Essex. *October 30th*, 1951.

ROYAL COLLEGE OF VETERINARY SURGEONS

Membership Examinations, December, 1951

List of Successful Candidates

London (continued) :

Second Examination

Physiology only

Abraham, B. F.
Alexander, T. J. L.
Ansell, R. H.
Arnold, J. H. S.
Barton, C. R. Q.
Beesley, C. J.
Benbow, G. M.
Breese, J. L.
Brocklesby, D. W.
Buxton, Peter
Bywater, J. E. C.
Cawthorne, W. N.
Douch, J. A.
Gibson, F. E. T.
Gillett, T. G. F.
Hambrook, C. L. E.
Hammond, Miss W. M.
Hampshire, F. J. W.
Holmes, J. R.
Holmes, R. G.
James, P. H.
King, D. K. (credit)
Loving, Charles
McVoy, K. I.
Maynard, H. M. F.
Mears, R. H.
Nelson, G. J.
Nestel, B. L. (credit)
Olorenshaw, P. H. (credit)
Roberts, D. H.
Russell, G. H.
Smith, Miss L. C.
Stalbow, Michael
Thursby-Pelham, R. H. C.
Tiffin, R. B. (credit)
Vinsen, M. A.
Vinycomb, Miss H. M. (credit)
Waller, J. F.
Walter, A. J.
Wells, A. R.

Third Examination

Hygiene only

Anderson, D. C.
Barley, A. P.
Biggs, P. M.
Bloomberg, J. H.
Box, P. G.
Carter, H. E.
Carter, J. B.
Clay, Daniel
Cochrane-Dyet, I. G. C.
Cox, J. A.
Cunningham, J. A.
Evans, J. M.
Fell, B. F.
Freudenthal, G.
Godfrey, M. J.
Hall, S. A.
Haxby, D. L.
Hayes, T. J.
Hooker, Miss P. M. W.
Hullis, Roy
Hunter, F. E.
Jones, J. E.
Jones, M. D. B.
Jordan, A. N.
Keywood, E. K.
Kirby, M. A.
Lane, D. R.
Levens-Ing, Miss P. J.
Malone, J. C.
Martin, H. T. W.
Menard, F. R. J. R.
Michael, J. R.
Morris, A. D.
Pepper, R. T.
Rabbich, P. D.
Reid, J. H.
Richards, M. A.
Rodgers, M. J.
Russell, G. P.
Samuel, R. M.
Simpson-White, P. H.
Smith, G. R.
Smith, P. L. F.
Stear, R. T.
Swan, A. I.
Tew, N. C.

Thomas, J. L.
Townsend, G. H.
Walker, Miss G. M.
Watson, K. R.
White, R. C.
Wilkins, G. T.

THIRD EXAMINATION

Pathology only

Barnsley, D. G. C.
Carnaghan, R. B. A.
Catterall, P. W.
Clarke-Williams, P. R.
Clifford, R. J.
Evans, A. D. G.
Ford, G. K.
George, J. K.
Grattan, D. A. P.
Herbert, W. J.
Keymer, I. F.
Langford, S. H.
Malseed, J. R.
Monks, R. W. M.
Redmond, M. R. (credit)
Rees, R. B.
Thuraisingham, S.
Tiedeman, B. G.
Rawlins, J. A.
Wilkinson, J. S.

Liverpool :

SECOND EXAMINATION

Both subjects

Shaib, B.

THIRD EXAMINATION

Hygiene only

Illingworth, H. M.

Pathology only

Davies, J. E.
Grainger, K. J.
Hedger, R. S.
Kaluski, S. J.
Lewis, E. O.

FINAL EXAMINATION

Dawkins, H. P.
Hyslop, N. St. G.
James, R. H.
Jones, K. W. R.
Keay, A. J.
Roberts, H. G.
Roddis, A. F. (M)

(M) denotes credit in Medicine.

Edinburgh :

FIRST EXAMINATION

Garden, S.
Hovell, G. J. R.
Johnson, D. E.
Stewart, J. G.

SECOND EXAMINATION

Black, Michael
Forsyth, D. W.
Fraser, J. A.
Griffiths, T. G. G.
Kerr, J. B. C.
Rodger, D. S.
Watson, A. R. A.
Watson, Michael

THIRD EXAMINATION

Baird, A. C.
Blizzard, S. V. A.
Gilchrist, Miss H. G. R.
Gourlay, R. N.
Hutton, P. H.
Kermack, N. R.
McKinlay, D. I.
Thomson, K. S.
Watson, H. B.
Wilson, H. R.

FOURTH EXAMINATION

Beck, C. J.
Bennett, D. G.
Bonn, J. M.
Bowler, R. K.
Dawson, R. T.
Edgar, James
Fraser, J. S.
Goodchild, W. M.
Goss, C. J.
Merry, S. J.
Mindel, J. B.
Mitchell, A. W. (Paras)
Plummer, G. A.
Sanderson, J. F.
Stokes, P. M.
Temiyachol, P.
Thomson, A. P.

(Paras) denotes credit in Parasitology.

FINAL EXAMINATION

Adamson, I. W.
Anderson, R. A.
Bruce, I. H. M.
Campbell, K.
Clark, Miss S. T.
Clemo, J. A.
Crawford, Miss H. F.
Hildebrand, W. R. P.
Jackson, O. F.
Menon, M. N.
Skowronski, Z. Y. K.
Watkins, L. S.

Glasgow :

THIRD EXAMINATION

Berger, F.
Bradley, J. A. P.
Crawford, T. G.
Gilmour, M. J.
Jawara, S. A.
Slater, D.
Stewart, G. H.
Taylor, J. W.

FOURTH EXAMINATION

Anderson, A. C.
Cunningham, M. P. (Paras)
Gittleson, M. L.
Hamilton, R. C.
Jackson, W. G.
Knight, T. A.
Laing, D. F.
Leach, P. A. G.
Lyons, A. R.
McKeen, Hugh
McLachlan, Iain
McLauchlan, Ian
MacMillan, I. A.
Morgan, D. L.
Ricketts, Miss B. C.
Skinner, D. I.
Skulski, G.
Taylor, A. McK. (Paras)
Todd, D. T.
Townley, Miss D. (Path)
Watson, J. G.
Watson, R. C. (Paras)
*Watt, W. R.
Whiteford, Miss J. M.

* denotes 2nd Class Honours.
(Path) denotes credit in Pathology.
(Paras) denotes credit in Parasitology.

FINAL EXAMINATION

Ahmad, S. A.
Angus, C. E.
Bellinge, W. H. S.
Brewster, J. R.
Calder, R. H.
Doak, Miss M. S. P.
Fitzsimmons, W. M.
Forrester, W. A.
Henderson, G. N.
MacIntyre, D. I.
McPhee, A. A.
Moffat, Robert
Nelson, John
Robertson, D.
*Smith, Dr. M. F.
Stanhope, D. T.
Taylor, M. M.
Vincent, J. F. D.
Waddelow, I. R.
Walls, T. J. R.
White, M. G.
Williamson, J. B.

* denotes 2nd Class Honours.

Dublin :

FIRST EXAMINATION

Boyd, J. R.
O'Neill, T. J.

SECOND EXAMINATION

Physiology only

Abrahamson, D.
Ballesty, J. J.
Byrne, J. G.
Daly, D. G.
Daly, Edward
Fenlon, P. J.
Flavin, M. J.
Foley, J. E.
Goold, M. C.
Guerin, W. A.
Guven, W. A. (credit)
Hally, W. P.
Hannan, John
Harbord, R. S. (credit)
Hartigan, P. J.
Henehan, M. D.
Jameson, J. G.
Keane, P. A.
Kent, Martin
Liffey, P. K.
Littlewort, M. C. (credit)
McDonald, P. J.
O'Brien, M. W.
Rhatigan, P. J.
Strickland, K. L. (credit)
Tuite, Michael
Twomey, Thomas
Tynan, A. R.
Walsh, M. C.
White, J. J.

Anatomy only

Barry, K. T.
Cox, Edward
Fleming, A. R.
McInerney, J. F.
McManus, D.
O'Neill, W. J.

THIRD EXAMINATION

Hygiene only

Chapman, W. R.
Cullen, R. G.
Deeney, E. E.
Dowling, J. P.
Driscoll, C.
Flanagan, William
Gray, R. F.
Hernon, P. C.
Houlihan, T. V.
Hurley, M. C.
Johnson, R. E.
Kelly, Jeremiah
McGrath, M. J.
O'Keeffe, D. J.
Toolan, G. A.
Walshe, P. D.

Pathology only

Carolan, E. S. E.	McGirr, P. J.
Darcy, Thomas	Mulligan, T. D.
Harte, J. E.	Murphy, O. J. N.
Keane, J. J.	O'Connor, Cormac
Lucey, D.	O'Loughlin, M. J.
Lyons, T. M.	Phelan, J. J.
McClintock, S. J.	Scott, W. A.

Fourth Examination (*Old Syllabus*)

O'Byrne, T. F.	Pentland, W. H.

Final Examination (*Old Syllabus*)

Leavy, J. J.	Walls, W. T.
O'Callaghan, F. J.	

Final Examination (*Revised Syllabus*)

Casey, P. J. P.	O'Rourke, W. J.
Crowe, J. A.	Purcell, Philip
Doyle, Aidan	Roddy, R. M.
Johnson, D. P.	Schorman, N. S.
McGlinchey, D. E.	Scully, M. A.
Magee, J. H.	Tyrrell, K. M.
O'Connor, P. J. M.	

(*To be concluded*)

NOTES AND NEWS

Diary of Events

Jan. 3rd.—Meeting of the Central Veterinary Society, at the Royal Veterinary College, Camden Town, 6 p.m.

Jan. 4th.—Meeting of the Association of Veterinary Teachers and Research Workers (Scottish Branch), in the University of Glasgow Veterinary School (83, Buccleuch Street), 9.30 a.m.

Jan. 9th.—Meeting of the Association of Veterinary Teachers and Research Workers (Southern Region), at the Royal Veterinary College, Camden Town, N.W.1.

Jan. 9th, 10th and 11th.—Meeting of Committees and Council, R.C.V.S., at 10, Red Lion Square, London, W.C.1.

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PERSONAL

Dr. H. C. Lamont Appointed to Chair of Comparative Pathology at Queen's University, Belfast

As we go to press we learn that at the special yearly meeting of the Senate of the Queen's University of Belfast, Hubert Gibson Lamont, O.B.E., D.Sc., M.R.C.V.S., Director of the Veterinary Research Division at Stormont, was appointed to the Chair of Comparative Pathology.

Further reference to Dr. Lamont's appointment will be made in an early issue.

. . . .

The Colonial Office announces the following appointments in the Colonial Veterinary Service: Mr. J. F. F. Callear, M.R.C.V.S., Veterinary Officer, to be Senior Veterinary Officer, British Guiana; Mr. N. M. Noble, M.R.C.V.S., as Veterinary Officer, Sierra Leone; Mr. W. Pratt, M.R.C.V.S., as Veterinary Officer, Kenya, and Mr. J. D. Turton, B.Sc., M.R.C.V.S., as Veterinary Officer, Gold Coast.

. . . .

University of Edinburgh Tindal Scholarship.—The Faculty of Medicine of the University of Edinburgh have awarded the Tindal Scholarship, worth £45, to Mr. Robert Burrows, B.Sc., M.R.C.V.S., as the most distinguished student qualifying in July, 1951. Mr. Burrows is now on the staff of the University of Bristol School of Veterinary Science.

. . . .

Birth.—O'Connor.—On December 3rd, 1951, at the Leinster Nursing Home, Dublin, to Angela (*née* Crilly), wife of J. Desmond O'Connor, M.R.C.V.S., a son.

Marriages.—Donald—Garden.—On December 15th, 1951, at High Hilton Church, Aberdeen, Leonard Greig Donald, B.Sc., M.R.C.V.S., only son of Mr. and Mrs. C. G. Donald, Edinburgh, to Margaret, elder daughter of Mr. and Mrs. A. S. Garden, Aberdeen.

Pitcher—Young.—On December 5th, 1951, at Holy Trinity Church, High Wycombe, Leighton Pitcher, M.R.C.V.S., son of Charles James Pitcher and the late Mrs. Pitcher, Overs Farm, Wooburn Green, to Barbara Joan, daughter of Mr. and Mrs. Sydney Young, Totteridge, High Wycombe.

Spalding—Quinn.—On November 28th, 1951, at St. Michael's Church, Dunlaoghaire, Co. Dublin, Valentine Thomas Spalding, M.R.C.V.S., elder son of the late Valentine Spalding and of Mrs. Spalding, of Weybridge, to Nancy, only daughter of Mr. and Mrs. John Quinn, of Ennis, Co. Clare.

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R.C.V.S. OBITUARY

Thompson, Joseph, The Bungalow, Dublin Road, Rathfriland. Graduated Glasgow, May 27th, 1890. Died December 8th, 1951; aged 86 years.

Mr. Joseph Thompson, M.R.C.V.S.

In its issue of December 10th, *The Northern Whig*, Belfast, states that Mr. Thompson was a native of Ballynahinch. He qualified at Glasgow Veterinary College in 1890 and was a lecturer there for four years.

Over 60 years ago he went to Castlewellan and built up an extensive practice in that area. At one time he was port inspector at Dundrum and was an hon. veterinary surgeon at shows and gymkhanas in the Castlewellan and Newcastle districts.

A member of the Presbyterian Church, he was a P.M. of St. Paul's Masonic Lodge 142.

Mr. Thompson is survived by four sons and one daughter.

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VETERINARY PANEL TO ENQUIRE INTO DOPING OF RACEHORSES

It is stated on the authority of Lord Irwin, a member of the Jockey Club, who was a Steward last year, that the Club has appointed a panel of veterinary surgeons to investigate the doping of racehorses; it is to conduct a "specific enquiry into the methods employed by those responsible to administer dope."

Lord Irwin added, states *The Daily Telegraph*, ". . . I cannot over-emphasise the importance of this investigation.

"The panel has been given the widest possible terms of reference. It will probably enquire into the question of routine checks on racehorses, the types of dope used and their effects.

"When the panel has completed its investigation it will make recommendations to the Stewards of the Jockey Club, specifying what action should be taken to put a stop to doping."

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax:

Flints.—Bryn Edwin Farm, Flint (December 11th).

Herefordshire.—Tack Farm, Moreton Jefferies, Bromyard (December 10th).

Kent.—Barnfield Farm, Charing, Ashford (December 11th).

Perthshire.—Easter Coilechat Farm, Callander (December 10th).

Foot-and-Mouth Disease:

Norfolk.—Quaker Farm, Wramplingham, Norwich; The Heath, Filby, Gt. Yarmouth (December 12th).

Suffolk (E.).—White House Farm, Flixton, Lowestoft (December 10th); Locks Road Farm, Westhall, Halesworth (December 12th).

Yorks (E.R.).—Grange Farm, Swanland, North Ferriby (December 12th).

Fowl Pest:

Lancs.—All at Preston: Glenthorne and Smithy Lane Farm, Moss House Lane, Much Hoole (December 10th); South View, Gill Lane, Longton; Glengarry Farm, Rosembry Lane, Bartle, Woolplumpton (December 12th).

Lincs (Parts of Lindsey).—Whitehall Farm, Bilby, Barnetby (December 11th).

Swine Fever:

Beds.—Heddings Farm, Wybaston (December 12th).

Bucks.—Cippenham Lane Piggeries, Slough (December 13th).

Glamorgan.—83, Richards Street, Maerdy, Ferndale, Abergavenny (December 13th).

Herts.—Bareleigh Farm, Aston, Stevenage (December 12th); Knoll Bungalow, High Cross, Ware (December 13th).

Lanarks.—East Cadder Farm, Kirkintillock (December 10th).

Lincs (Holland).—Kemp Street, Crowland, Peterborough (December 11th); Memorial Lane, Gedney Dyke, Spalding (December 13th).

Lancs.—White House Farm, Bold Lane, Collins Green, Burton Wood (December 13th); Piggeries at Mill Lane, Warrington (December 14th).

Norfolk.—Jubilee Hall Farm, Gayton, King's Lynn (December 10th).

Northants.—280, The Croft, Bedford Road, Rushden (December 10th).

Notts.—Hockerton Moor Farm, Kirklington, Newark (December 11th).

Yorks (E.R.).—Whinhill Farm, Ottringham, Nr. Kingston-upon-Hull (December 12th).

* * * * *

IMPORTATION OF POULTRY CARCASES FROM FRANCE

Since May 1st, 1951, imports of poultry carcases from France have been prohibited because of the risk of fowl pest. Following discussions between the Ministry of Agriculture and Fisheries and the French Authorities, however, arrangements have now been made whereby poultry carcases will be admitted into Great Britain, subject to certain conditions, if the birds concerned have been hatched and reared in a specified area in France in which fowl pest is believed never to have existed. The area from which imports will be allowed consists of the following départements:—

Ain, Allier, Cher, Côte d'Or, Eure, Eure-et-Loire, Indre, Indre-et-Loire, Loir-et-Cher, Loiret, Mayenne, Maine-et-Loire, Nièvre, Orne, Rhône, Sarthe, Seine et Marne, Saône et Loire and Yonne.

All carcases imported under these arrangements must be accompanied by a certificate signed by an authorised veterinary officer of the French Government stating:—

(a) the name of the département in which the birds were hatched and reared;

(b) that the département is free from fowl pest; and

(c) that the carcases are of birds dressed in an establishment in which at the time there were no birds or carcases not intended for export to Great Britain.

Persons wishing to import poultry carcases from the specified area must obtain a licence from the Ministry of Agriculture and Fisheries. Applications should be addressed to the Secretary of the Ministry, Hook Rise, Tolworth, Surbiton, Surrey, and should state the name of the port in this country through which the poultry will pass and the name and address of the consignee.

The French Authorities have agreed to a number of safeguards to ensure that birds intended for Great Britain are segregated at all stages from all other poultry. They are also arranging for the inspection, by the veterinary service, of the premises from which birds will be collected and for the testing of a proportion of the birds both on farms and after collection. The Ministry will be notified by telegram if an outbreak of fowl pest occurs in the area.

The Ministry of Agriculture is satisfied that poultry may be imported from France under the above arrangements without danger to our own poultry flocks. As a further check, however, a proportion of the carcases arriving in this country will be tested for the presence of fowl pest.

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"ABOMINABLE SNOWMAN" A MONKEY?

The late Captain Guy Dollman's suggestion, made in a letter to *The Times* published on July 19th, 1937, that the tracks of the legendary "Abominable Snowman" of the Himalayan range, attributed by natives to monstrous origin, might in fact be those of a langur monkey, receives support from photographs of tracks taken by Mr. Eric Shipton and reproduced in that periodical on December 7th.

"It has long been clear to scientists that they were made by animals, though not necessarily always by the same species," writes the Museums Correspondent in a subsequent issue. Those photographed in 1937 by the late F. S. Smythe were confidently and no doubt correctly identified by the late R. I. Pocock as having been made by a brown bear, *Ursus arctos isabellinus*.

"The authorities at the British Museum (Natural History) state, however, that the tracks found and photographed this year by Mr. Shipton are certainly not those of a bear, but of a langur monkey, presumably *Presbytis entellus achilles*, of which the type specimen (now in the museum collection) comes from a locality 12,000 feet above sea level and about 50 miles north-west of Katmandu, in Nepal.

"The langur or entellus monkey ranges in various forms from Ceylon through peninsular India to Sikkim, Kashmir, and southern Tibet. The form or sub-species *achilles*, first described by Pocock in 1928, has for its range 'Sikkim and Nepal, at high altitudes; ? Kashmir' according to the recently published 'Checklist of Palaearctic and Indian Mammals,' by Sir John Ellerman and Mr. T. C. S. Morrison-Scott. This particular sub-species is brown, with a bare black face and silvery head and underside. When standing on its hind legs, as it occasionally may, it would be about 5 foot tall. Its hind feet measure up to 8¾ inches in length.

"These facts fit in remarkably well with the account (quoted by Mr. Shipton in his special article) given by a Sherpa porter who described a 'yeti,' or snowman, which he claimed to have seen at 25 yards range as 'half man, half beast, about 5 feet 6 inches tall, covered with reddish brown hair but with a hairless face.'

"Of the photographs published yesterday that on the left shows tracks which were apparently made by the langur as it bounded along, putting down first its two front feet side by side, and then its hind feet, also close together, and on top of the rear part of the marks made by the two front feet. This gives the effect of a single line of large bi-lobed footprints.

"The Natural History Museum has put on a special exhibit which includes a specimen of *Presbytis entellus achilles*."

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LEGAL NOTES

Illegal Practice of Veterinary Surgery

ANOTHER SUCCESSFUL R.C.V.S. PROSECUTION

Before the Chairman and Justices at Romford Petty Sessions on November 29th, John Joseph William Dowling, of Maidstone Avenue, Romford, pleaded guilty to six summonses for practising veterinary surgery on a dog, the property of Mrs. P. M. Williams, while not being registered. He also pleaded guilty to a seventh summons in respect of "holding out as being prepared to practise veterinary surgery" in displaying a notice at his place of residence "Canine and Feline Surgery—Animals painlessly destroyed."

Prosecuting for the Royal College of Veterinary Surgeons, Mr. J. M. Ahern said that there was nothing to stop a person practising as an unqualified doctor as long as he did not hold himself out to be a fully qualified medical man. He was a "quack," but as far as animals were concerned it was much more serious. "An animal has no say whether he is prepared to be treated by a 'quack,'" he said. "Parliament in the interests of animals made an Act in 1948 ruling that no one should practise as a veterinary surgeon unless they possessed the necessary qualifications." In 1949 Dowling applied to be placed on the supplementary register. The application was refused, but Dowling was told that if he was aggrieved he could appeal. "He did not appeal, so he became debarred from carrying on as a veterinary surgeon," said Mr. Ahern. "By displaying a sign outside his house to the effect that he treated animals, he was clearly holding himself out as being a veterinary surgeon."

As far as the dog was concerned, Mrs. P. M. Williams recently moved to the district. Her dog became very ill, his coat was coming off and there was a discharge from his ears, so Mrs. Williams took the dog along to see defendant, thinking him to be a qualified, registered veterinary surgeon. After an examination, Dowling said the dog was suffering from mange, gave Mrs. Williams a substance and charged her 5s. She went back on five other occasions because the dog seemed to be getting worse instead of better. On one of the visits defendant prescribed a sulphur ointment. Mrs. Williams was charged 5s. each for five of the visits and 3s. 6d. for one visit.

As the dog was not getting better she took it to a Romford veterinary surgeon. He diagnosed that the dog was suffering from pruritus—not mange—and that the sulphur especially was entirely the wrong treatment, and would aggravate the skin complaint.

Mr. Ahern went on: "The Royal College takes a very serious view of this case. There are frequent cases of people who carry out veterinary treatment on animals, being unaware it is against the law. But this man had full knowledge that he was doing wrong." Not only was Dowling deceiving the public, but wrong treatment meant cruelty to animals.

Defending, Mr. F. J. Gerrey said that Dowling had been practising for 30 years. After his application to go on the supplementary list had been refused he carried on as a veterinary surgeon because he was a true lover of animals and it was a way of supplementing his wages.

Dowling expressed his regret and gave an assurance that he would not treat animals again. The notice outside his house had been taken down.

Dowling was fined £1 and 10s. 6d. costs on each of the seven charges, and given eight days to pay.

SLAUGHTER OF HORSES PAST SERVICE: LIVERPOOL COUNCIL'S DEBATE

The slaughter of 10 horses incapable of further effective service was the subject of a debate by Liverpool City Council on December 5th.

Councillor D. F. Brady (reports the *Liverpool Evening Express*) moved that the animals, instead of being killed, be disposed of to approved animal charities. The Highways and Planning Committee, he said, was acting out of excessive zeal. The horses were famous blood stock and had received the finest attention. Consequently, they were in better condition than other horses of similar age. The average age was just over 12 years and the horses were practically in their prime. Animal charities would receive a great setback if a great Corporation like Liverpool accepted the view that death was the only reward for faithful service. They should ensure the horses a few more years of life.

Alderman T. H. Burton suggested that the horses could perhaps do excellent work on the land.

The Chairman of the Committee, Councillor J. E. Thompson, said a veterinary surgeon had certified that the horses were unfit for further work owing to lameness and sickness. There was no purpose, therefore, in sending the horses to a rest home. It would only perpetuate their sufferings.

Alderman J. Harrington said rations for such could not be obtained in these days. The horses were not fit for any work. It was a shame to keep them alive and anyone working them could be prosecuted. "It costs £40 a week to keep them standing in the stables," he said.

Alderman B. V. Kirby expressed the view that the horses should be "pensioned-off" and sent to a home of rest. They should not be sold to be shot and perhaps sent to a meat shop.

Replying to a question of Alderman the Rev. H. D. Longbottom, Councillor Brady expressed the opinion that any cost of sending the horses to a home could be met by voluntary subscription.

Councillor Brady's amendment was defeated and the committee's minutes were approved.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

"ANAVENOL" AS AN ANAESTHETIC

Sir,—Recent correspondence in your columns has raised certain matters relating to the use of "Anavenol" as an anaesthetic. Perhaps I may be allowed space to reply briefly now to the main points, which I am discussing more fully in a paper to be submitted to you in the New Year.

The first point was that we have no certain knowledge that an animal is unconscious when given "Anavenol" in anaesthetic doses. This is perfectly true and was the reason for the use of the phrase "that the animal *appears to be* completely unconscious" in my paper (*Vet. Rec.* **62.** 500). But then we have no direct evidence whatsoever that any animal is in fact unconscious following the administration of any chemical substance as an anaesthetic, although in practice we may have good evidence for assuming that they are, as indeed we have in the case of "Anavenol."

The second point was that the ascending action of "Anavenol" on the nervous system apparently was similar to that produced by curare and that therefore "Anavenol" could be assumed to have a curare-like activity. This is entirely at variance with the established facts. "Anavenol" has no curare-like activity as determined by the recognised pharmacological techniques for detecting such activity, nor does the character and sequence of the clinical signs of the action of "Anavenol" on the horse's nervous system resemble, other than superficially, those produced by curare. Curare acts on autonomic nerve structures producing a peripheral paralysis of ske'etal muscles; "Anavenol" does not. In full doses intravenously curare is a stimulant and even a convulsant to the central nervous system; "Anavenol" is a depressant.

One of your correspondents, Mr. Gold, refers to certain anaesthesias we conducted together in 1946, when the use of "Anavenol" was in its infancy. My case records hardly support Mr. Gold's interpretations. My records show that we did two, not three, anaesthesias and that, in assessing the results at the time, on each case there is a note that the anaesthesia was not as satisfactory as it should have been, attributed to failure to give an adequate induction dose quickly enough. This was due largely to unforeseen factors. Briefly, the horses, both thoroughbreds, were fidgety due to midsummer flies, and this was aggravated in the first case by sidelines being flicked into position during the middle of my induction from the standing position, a procedure which upset the animal somewhat and caused the interruption of the injection. After quieting the horse, the induction was completed from the standing position and an undescended testicle and a scirrhous cord were removed during 15 minutes of quiet anaesthesia. The second horse, which had its left jugular vein completely occluded by an old scarring of the mid-neck skin, went down quietly from the standing position after only 14 mg. of "Anavenol" per kg. bodyweight had been injected, a dose I now know to be much too small to give satisfactory surgical anaesthesia; more "Anavenol" was required, when the horse was recumbent, before quiet anaesthesia was obtained, during which warts on the withers were removed satisfactorily. Mr. Gold reported that both horses made uneventful recoveries. Any failure to provide a perfect demonstration of anaesthesia should, I think, be attributed more fairly to Mr. Gold's and my inexperience in the technique of administration of "Anavenol" rather than to defects inherent in "Anavenol" itself. After all, one is fortunate if all goes perfectly the first time two strangers use a completely new drug to anaesthetise thoroughbreds without the help of trained grooms.

I can understand that some practitioners with long experience of the older anaesthetics may find it difficult to accept the unusual sequence of the clinical signs of the anaesthesia induced by "Anavenol," but I would suggest that this is hardly sufficient reason for condemning "Anavenol" without providing details of adequate clinical trial. There are many who have used and are using "Anavenol," in some cases extensively, and who are satisfied that it is an anaesthetic, and that for certain procedures it is the anaesthetic of choice.—Yours faithfully, H. B. Parry, The Animal Health Trust, Canine Research Station, Kennett, Nr. Newmarket, Suffolk. *December 14th*, 1951.

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KERATITIS IN CATTLE

Sir,—I am prompted by the article on "Keratitis in Cattle" by Mr. Hall-Patch (*Vet. Rec.*, Dec. 8th, 1951) to make the following comments:—

I have had experience of two outbreaks. The first commenced at the end of November, 1950, and fresh cases occurred during the succeeding five weeks. The second commenced in May, 1951, in yearling beef cattle running in the open and ceased to spread after three weeks even though the beasts' eyes were covered with flies. About 40 per cent. of the housed cattle but only approximately 30 per cent. of the outlying cattle were affected.

During recent weeks I have examined both groups of cattle again. Only one animal, one of the housed calves, was totally blind. About 10 per cent. of the housed cattle but about 20 per cent. of the outlying cattle were completely blind in one eye. No treatment of the outlying cattle was attempted, but the varying methods adopted for the housed cattle (penicillin, sulphathiazole, zinc sulphate, etc.) seem to have reduced the number of blind eyes.

In the first few days of December this year the condition appeared again in calves housed at the same farm, under similar conditions to those of last year. A bunch of calves has been run through these buildings during the summer without any being affected.

It is obvious that flies cannot be the sole means of transmission. I be'ieve that the condition can lie dormant in the animal for a considerable time and springs up as the result of some irritation such as dust, cold draughts, flies or fumes from bedding.

I am indebted to Mr. Hall-Patch for information as to treatment with chloromycetin and am using it as he recommends on the 6 out of 60 calves already affected in the present outbreak.—Yours faithfully, H. L. Pook, 49, Endless Street, Salisbury. *December 8th*, 1951.

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DISHORNING OF CATTLE

Sir,—My knowledge of the subject consists of what I have read about it, but I consider an instrument could be evolved on the same principles as the tool which engineers use to cut bolts. It wou'd be quick in action and easy to handle, thus saving time and energy, and the cutting edges could with advantage be serrated and probably would prevent bleeding.—Yours faithfully, A. Hart, The Anchorage, Ardnadam, Dunoon, Argyll. *December 7th*, 1951.

Weekly Wisdom

Nowhere is it possible to draw an iron curtain across the field of our experience and proclaim either the exclusion of science from the one side or its totalitarian right on the other. What we have to do with is rather two diverse ways in which the whole territory of our human experience may be approached and explored.—Rev. John Baillie (Philosophical Discourse before the British Association, 1951).